First Copy

Construction Methods

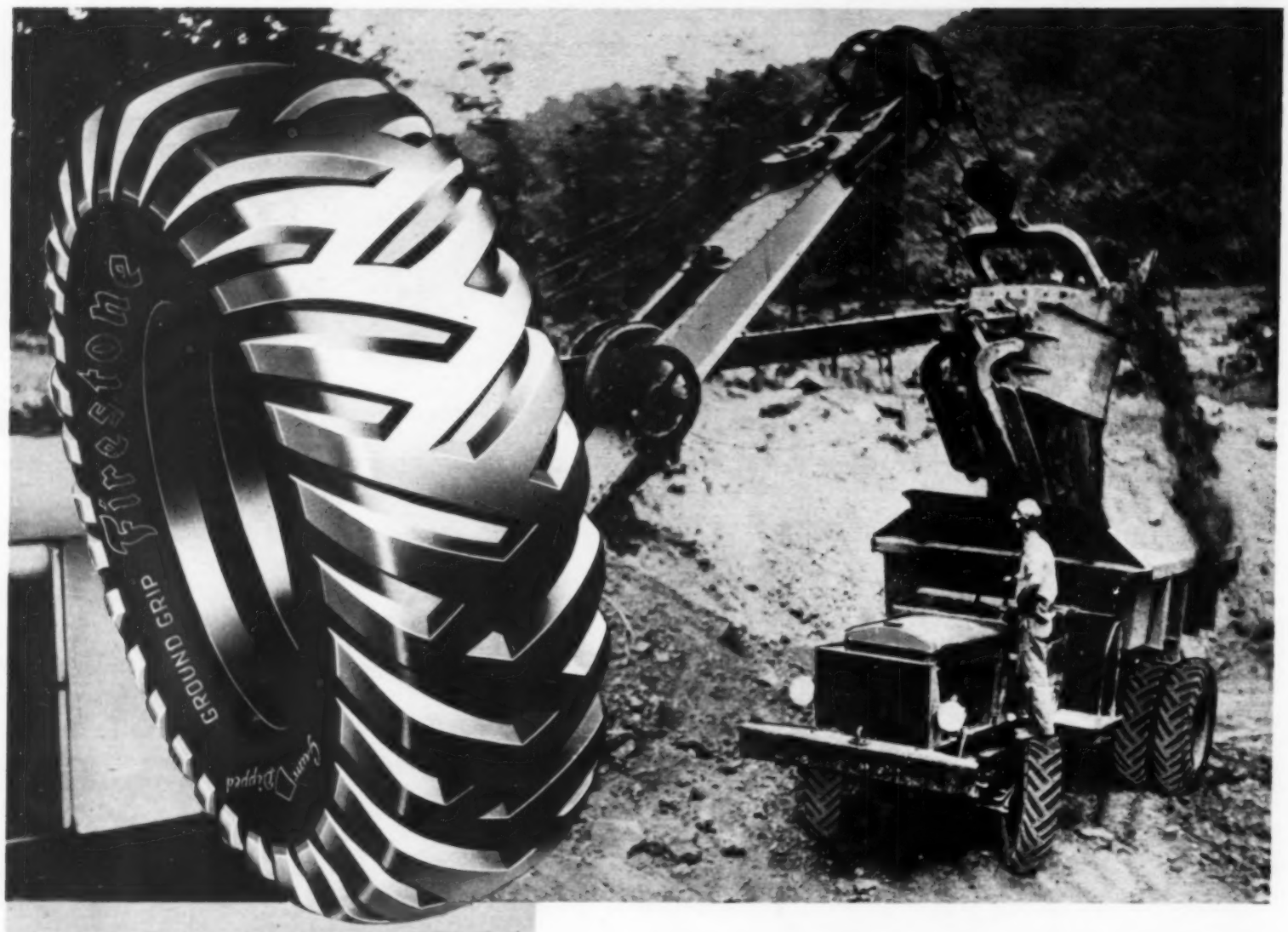
McGraw-Hill Publishing Company, Inc.

April, 1936

Price 20 Cents

BUCKET TO HOPPER TO CART is course of superstructure concrete at Hammond, Ind., filter plant.

In This Issue:



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CUT DOWN COSTS!

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HERE is super-traction — at lowest cost! On even the toughest jobs Ground Grip Tires save both time and money. These rugged tires pull equipment through sand, loose gravel, broken ground, mud, without chains. You will cut down your operating costs by eliminating delays, doing more work in less time. These remarkable tires make their own road — and they do not bump when driven on paved highways.

Firestone patented construction features give these tires tremendous strength to withstand the extra stresses and strains of super-traction. Gum-Dipped cords — soaked and coated with pure liquid rubber — make the tires stronger and more flexible. Two extra layers of these cords make the self-cleaning, super-traction tread and the body of the tire one inseparable unit.

Operate your equipment more economically — equip with Ground Grip Tires! See your nearest Firestone Auto Supply and Service Store or Firestone Tire Dealer at once.

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Firestone

Construction Methods

McGraw-Hill Publishing Company, Inc.,
330 West 42nd St., New York

ROBERT K. TOMLIN, Editor

APRIL 1936

WILLARD CHEVALIER, Vice-President

Editorial Staff: Vincent B. Smith, John B. Huttl, (San Francisco)
Leonard H. Church (Cleveland), Nelle Fitzgerald

Current Jobs

Buildings

Activity continues in the fields of public, commercial and industrial building construction. Recent public building awards include the following: $1,037,000 hospital at Houston, Tex., to **American Construction Co.** of Houston; $1,026,000 public school in The Bronx, New York City, to **National Excavation Corp.**, New York City; $1,200,000 addition to St. Luke's Hospital, New York City, to **Marc Eidlitz & Son, Inc.**, of New York; $646,000 additional buildings for Veterans' Administration in Little Rock, Ark., to **McGregor & Pickett**, of Little Rock; $534,500 infirmary at Coatesville, Pa., to **Sinclair & Grigg, Inc.**, of Philadelphia; $591,700 federal parcel post building at Dallas, Tex., to **A. J. Rife Construction Co.**, of Dallas; $510,000 armory at Schenectady, N. Y., to **A. H. Eckert Co.**, Albany, N. Y.; $1,109,497 court house at Oklahoma City, Okla., to **Manhattan Construction Co.**, of Oklahoma City.

For new industrial building awards the successful contractors have been: **Rust Engineering Co.**, of Pittsburgh, on a $4,000,000 paper mill at Crossett, Ark., for the Crossett Lumber Co.; **Morton C. Tuttle Co.**, of Boston, on a $3,000,000 plant at Houston, Tex., for the Champion Paper Co.; **Wark & Co.**, of Philadelphia, on a $1,000,000 project for several buildings at Meadville, Pa., for the Viscose Co.; **Lummus Co.**, New York City, on a $750,000 refinery at Toledo, Ohio, for the Pure Oil Co.; **McKenzie-Hague Co.**, of Minneapolis, on a $700,000 grain elevator at Shakopee, Minn., for Cepro, Inc.

Sewers

Chicago's Sanitary District let a $1,115,970 outlet sewer contract in Berwyn, to the **McKay Engineering & Construction Co.**, of Chicago. In New York, **Dimenna & Cleverock, Inc.**, received from the city's Department of Sanitation a $965,490 award for intercepting sewers in upper Manhattan. Louisville, Ky. named **Joseph and Robert Lombardi**, of Philadelphia, as contractors for the $650,084 Mill Creek sewer. Another Chicago Sanitary District sewer award was to **Michael Pontarelli**, of Chicago, for a $643,600 section of the Upper Des Plaines intercepting sewer. In Medford, Mass., **V. Barletta**, of Jamaica Plain, Mass., bid in the $502,880 project for a section of the North Metropolitan relief sewer.

Bridges

Merritt-Chapman & Scott Corp., New London, Conn., was low bidder, with a tender of $1,028,503, for the substructure of the Connecticut River bridge between Middletown and Portland, Conn., involving two 600-ft. steel arches on concrete piers and 28 plate girder approach spans; for the superstructure **Bethlehem Steel Co.** was low with $1,085,539. Across Jones Falls Valley in Baltimore, Md., a $573,575 concrete arch bridge with rubble stone facing is under construction by **Potts & Callahan, Inc.**, of Baltimore. **American Bridge Co.**, of Pittsburgh, obtained the $1,080,802 contract for the superstructure of the 3,300-ft. long Homestead high-level bridge at Pittsburgh. Paving of the Wards and Randalls Island viaducts of the Triborough Bridge, New York, is being started by **Tully & DiNapoli**, of Long Island City, under a $571,245 contract; the same firm was low, with a bid of $314,729, for building end ramp and paving of the Bronx approach to the Triborough bridge.

How—

... For the benefit of readers concerned with the practical application of method or equipment the following references are to articles or illustrations in this issue that tell:

Waterworks

Contract for 46,757 lin.ft. of 60-in. welded steel pipe conduit in St. Louis, Mo., went to **Bethlehem Steel Co.** at a price of $542,880; the pipe will be laid by **Martin & Reilly**, of University City, Mo., for $151,792. Water purification structures at Louisville, Ky., will be built by **C. H. Tompkins Co.**, of Washington, D. C., for $410,711. **Campbell Construction Co.**, of Sacramento, is installing in that city two concrete water storage tanks for $315,347.

Current Jobs

Roads

A big letting of highway contracts in Ohio occurred last month, involving one batch of awards totaling $2,766,000. Among the larger projects were: 3 mi. of concrete paving to **R. J. Dienst**, of Columbus, at $438,604; grading, paving and bridge to **S. Monroe & Sons Co.**, of Portsmouth, Ohio, at $267,028; paving, drainage structures and viaduct to **Holmes Construction Co.**, of Wooster, Ohio, at $288,659; two contracts for paving, widening and bridge to **Hinton & Smalley**, of Celina, Ohio, at $405,506; brick pavement and bridge to **Hollinger-Davidson Co.**, of Akron, at $415,890.

Among recent road building awards have been: For bituminous construction in Montana, $178,668 to **Poston Bros.**, of Kalispell; $142,436 to **Lawler Corp.**, of Butte; $112,129 to **M. Wunderlich**, of Jefferson City, Mo.; $132,820 to **Lobnitz Bros.**, of Libby; $182,819 to **McNutt Bros.**, of Eugene, Ore.; $192,721 to **S. J. Groves Co.**, of Minneapolis. For an extension to the Hutchinson River Parkway, in Westchester County, New York State gave a $633,217 concrete paving contract to **Garafino Construction Co. & Rusciano & Sons Corp.**, of Mt. Vernon, N. Y. Two California paving and bridge contracts aggregating $518,955, in Monterey County, have been awarded to the **Peninsula Paving Co.**, of San Francisco. Also in California, **Griffith Co.**, of Los Angeles, obtained the $464,533 grading work on Sepulveda Boulevard in Los Angeles. New Jersey awarded a $1,388,549 job for 5 mi. of paving near Clifton to **G. M. Brewster**, of Bogota, N. J. Illinois is undertaking with relief labor and WPA funds a $2,500,000 project for a scenic highway along the Mississippi River between Alton and Grafton, Ill. For 4.7 mi. of reinforced concrete pavement near Andover, Conn., **Lane Construction Corp.**, of Meriden, Conn., submitted a low bid of $246,930.

Miscellaneous

Five Tunnels Holed Through—A veritable rash of tunnel holings-through has broken out on the Colorado River aqueduct in California. Five rock bores on which headings recently have met are: the 7½-mi. Iron Mountain tunnel (**Utah Construction Co.** and **Winston Bros.**, contractors); the 3-mi. Pasadena tunnel (**L. E. Dixon, Bent Bros. & Johnson**, contractors); the 3½-mi. Coxcomb tunnel **Winston Bros.**, contractors); the 1¼-mi. Sierra Madre tunnel (**J. F. Shea Co.**, contractor); and a 3-mi. section of the 13-mi. San Jacinto tunnel, built by the Metropolitan Water District's own forces.

Mississippi Highway Program — A loan and grant of $35,000,000 to the state of Mississippi for improving main highways has been approved by Public Works Administrator Ickes.

Funds for N. Y. Tunnel—For the construction of a vehicular tunnel under the East River between the boroughs of Manhattan and Queens, New York City, a sum of $58,365,000 has been made available through a PWA grant of $11,235,000 and a loan of $47,130,000, secured by bonds of the New York City Tunnel Authority which are to be retired from tunnel tolls. **Ole Singstad** is chief engineer for the Authority.

Arrowrock Dam — For adding 5 ft. to the height of the present 349-ft. Arrowrock dam on the U. S. Bureau of Reclamation's Boise project in Idaho, **T. E. Connolly, Inc.**, of San Francisco, has received a $395,040 contract.

AND WHO'S DOING THEM

AND WHO'S DOING THEM

The HOW *of It*

"I keep six honest serving-men
(They taught me all I knew):
Their names are What and Why and When
And How and Where and Who"

IN THESE lines Rudyard Kipling paid his tribute to the healthy curiosity that inspires men to learn more of their world and its ways. It is the ally of every teacher and journalist who would make his efforts most useful and productive for those he seeks to serve. Curiosity is the seed of knowledge and knowledge is a major instrument of accomplishment. Kipling's serving-men are the monitors who nourish that seed and spur the effort of those whose business it is to gather and impart useful knowledge.

Construction Methods is dedicated to that effort. Its special field is implicit in its name; it seeks to show construction men how others have handled their jobs and to stimulate them to more efficient practice on their own work.

In doing this the editors try to make full use of all six of Kipling's serving-men. But above all do they rely on *How*. For, to our readers, *How* is the key man of this powerful sextet. After we know the what and why, the where and when and who of any job, always looms the question, "Yes, but how?" That is the prime concern of the practical construction man: *how* should he analyse his job; *how* should he lay it out; *how* should he plant it; *how* can he use his equipment most effectively; *how* can he best handle this detail or that, *how*, in short, can he put to work on his job the experience of other men and his own special ability to produce the best job in the shortest time and at the lowest cost.

TO HELP answer these questions is the mission of *Construction Methods*. However much we still must do to realize the standard we have set for ourselves, the testimony of many construction men gives us reason to feel that we are making progress with that mission. But the constant care of the staff is to make the paper more and more useful and useable.

That is the reason for the new "How" index, carried on the first reading page. It grew out of a comment by a consistent reader. He pointed out that some readers seem to get out of the paper a lot more than do others and that sometimes this added value is derived from an obscure detail covered in the course of a long article. But others, who for one reason or another may not be particularly interested in the type of job covered by that article, frequently overlook "how" details that would be valuable to them.

"I suspect," he said, "that if you could sit down with each reader and go over the articles with him there wouldn't be one who would not find in each issue some bread-and-butter ideas that would be worth to him many times the cost of his year's subscription."

The editors didn't know about that but they were curious enough to have a look. So they went through a couple of issues, noting down some of the "how" details that might be overlooked by a casual reader. Soon they had a couple of sheets full of notes; the reader who made the suggestion certainly had called the turn. Then one of the editors asked:

"Why not run a list like that in every issue? It would be the next best thing to going over the issue with each reader. Let us just point out a few of the best cash-on-use ideas that are in the issue; then perhaps more readers will get the habit and dig up even more of them than we point out."

NO SOONER said than done; and there was the germ of the "How" index. Its purpose is to make *Construction Methods* more valuable to every practical reader by picking out from each article those details of method that may be useful to any construction man on any size or kind of job. After all, even the "big" jobs usually consist of a lot of "small" jobs and the methods and plant developed on them are just as useful to the man who may handle only the moderate or small sized jobs.

If this will help us to keep more construction men more closely in touch with the methods and equipment used by other men on other jobs and thereby put that faithful old servant, *How*, to work for more of them, we shall be gratified. That, after all, is what we are here for.

Willard Chevalier

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TRAC-TRUKS IN NATION-WIDE USE FROM *Cape Cod to California*

WIDENING CAPE COD CANAL -- CONSTRUCTION OF DE-SILTING WORKS AT THE ALL-AMERICAN CANAL, TRAC-TRUKS HANG UP ACKNOWLEDGED RECORDS ON THE *Biggest Jobs* ACROSS THE NATION

CHEAPER DIRT COSTS A PROVED REALITY—"EASY MANEUVERABILITY"...."FAST, SHORT TURNING" GAIN MARKED FAVOR PLUS BIG CAPACITY AND HIGH AVERAGE ROUND-TRIP SPEED

Trac-Truk appeal and acceptance have spread far and wide across the country, resulting in their selection to handle the earth hauling on scores of major jobs, — including the widening of Cape Cod Canal — building of Mississippi levees — digging the Florida short-cut waterway and in constructing a veritable multitude of dam embankment projects. To this already extensive use may now be added their big fleet operation on California's epoch making All-American Canal. This far reaching development and what it signifies in performance, serve to substantiate those who hail Trac-Truks as The Greatest of All Earth Movers.

EUCLID
THE PIONEER

THE EUCLID ROAD MACHINERY CO.
CLEVELAND, OHIO U. S. A.

How G-E *Power Selsyns*

keep world's longest lift span level as a billiard table

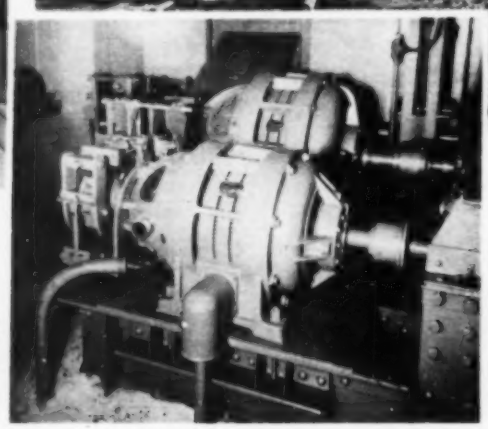
WITH its 544-foot span, the new Buzzards Bay Bridge, across the Cape Cod Canal, is the longest lift bridge in the world.

The driving motors at opposite ends of the bridge are kept in perfect step by power Selsyn apparatus—a General Electric development. This apparatus keeps the span as level as a billiard table. Compared with the ordinary method of installing the lifting mechanism at the middle of the span, this system:

1. Saves material
2. Saves power
3. Saves construction time
4. Improves appearance

Control of the bridge is simple—a few buttons and levers, conveniently placed on a control desk in the operator's house. Indicating lights and Selsyn height and skew indicators show the position of the span at all times. Variation from the horizontal is kept within ⅜ inch.

Whatever your construction requirements, let G-E engineers advise you on the profitable use of electric equipment. General Electric Co., Schenectady, N. Y.



Above: center span, more than 2100 tons, raised 130 feet in two minutes and kept level by G-E equipment. Middle: G-E motors and Thrustor-operated brakes on one of the towers. Left: clear indication and easy control at all times of bridge position by means of G-E equipment in control room.

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YOU GET SPEED FOR THE JOB
MORE SERVICE FOR YOUR MONEY
WHEN YOU USE G-E EQUIPMENT

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Send me a copy of your illustrated folder (GEA-2177) briefly describing the application of Power Selsyns and how they work.

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ON TRIBOROUGH BRIDGE

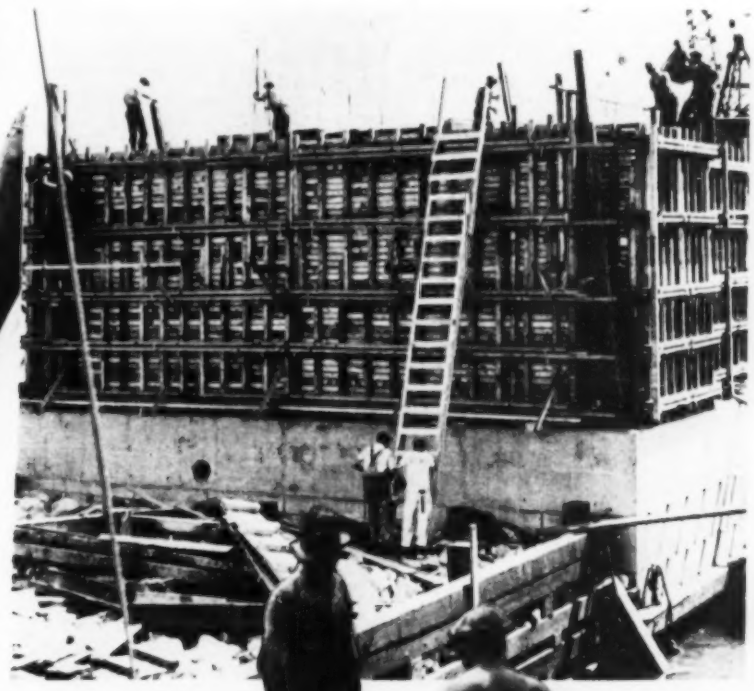
'INCOR' SOLVES DIFFICULT FORM PROBLEM

ON New York's Triborough Bridge, concrete piers for lift structure over Harlem River consist of four columns each 71′ in height, with horizontal stiffening slabs 5′ thick at four elevations. Corbetta Construction Co., sub-contractor for Frederick Snare Corporation, reduced form costs by first placing a 12″ slab of 'Incor' concrete. 24 hours later, they poured 4′ of ordinary concrete on the 'Incor' slab. By suspending forms from steel beams designed to carry the 12″ slab, all shoring was eliminated. Forms, and grid from which they were suspended, were removed in 24 hours and used on other piers. Right, concrete pier; below, pouring 12″ 'Incor' slab.

'Incor' is self-supporting in 24 to 48 hours, instead of 5 to 10 days. In concrete buildings, contractor can strip column forms first morning after concreting, floor forms that afternoon. Form reassembly begins at once. One form-set with 'Incor' does the work of 2 or 3 with ordinary cement.

By curing thoroughly in 24 to 48 hours, 'Incor' also lowers the cost and increases the certainty of obtaining strong, dense, watertight concrete. And, in addition, 'Incor' holds a concrete together better —it is easier to handle without separation. In placing by chutes, 'Incor' makes it possible to use a plastic mix instead of one that is wet and sloppy.

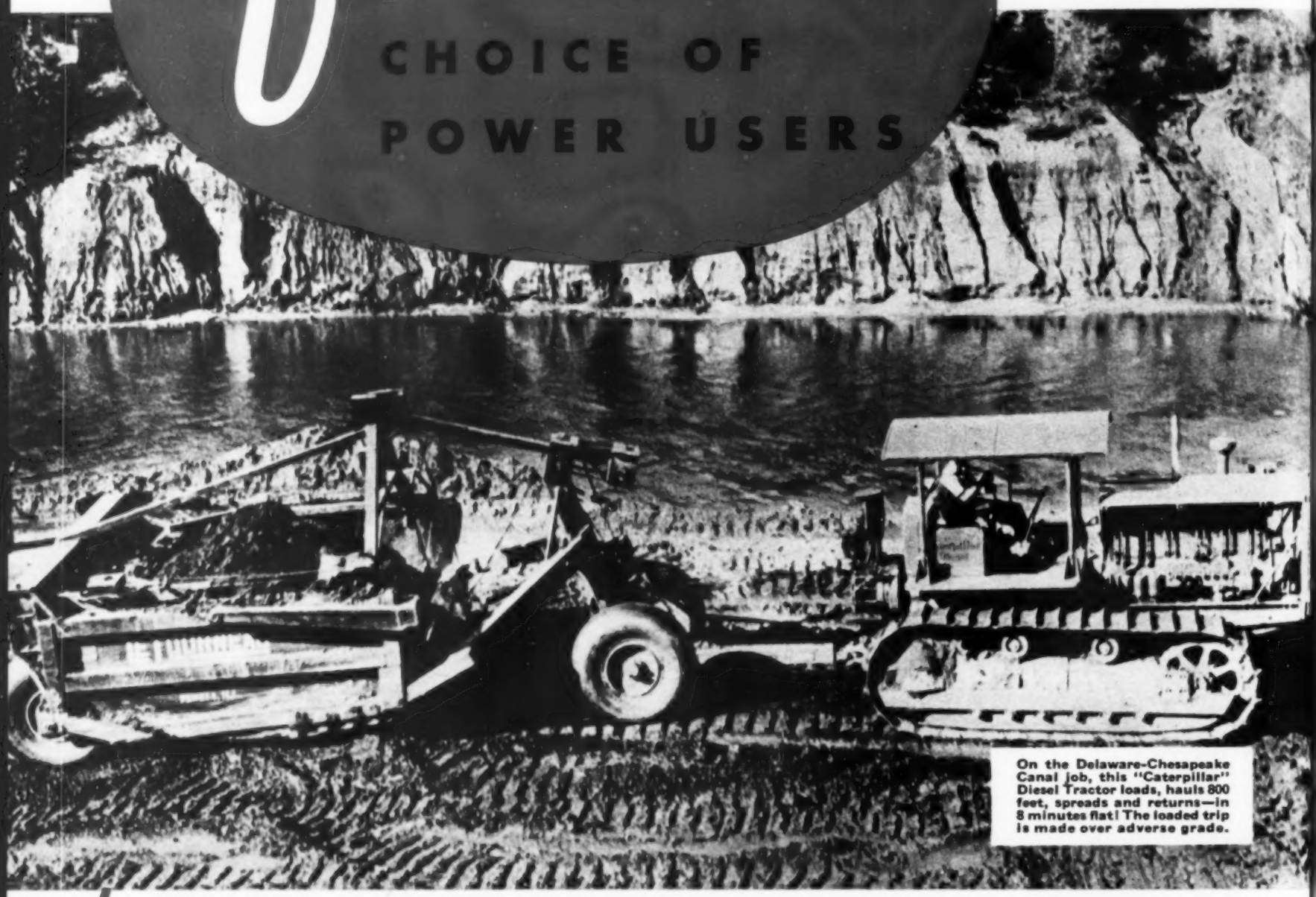
Use 'Incor'* on your next job—see for yourself the difference it makes. Made and sold by producers of Lone Star Cement, subsidiaries of International Cement Corporation, New York; also sold by other cement manufacturers. *Reg. U. S. Pat. Off.



'INCOR' 24-Hour Cement

first

CHOICE OF
POWER USERS



On the Delaware-Chesapeake Canal job, this "Caterpillar" Diesel Tractor loads, hauls 800 feet, spreads and returns—in 8 minutes flat! The loaded trip is made over adverse grade.

first IN PERFORMANCE

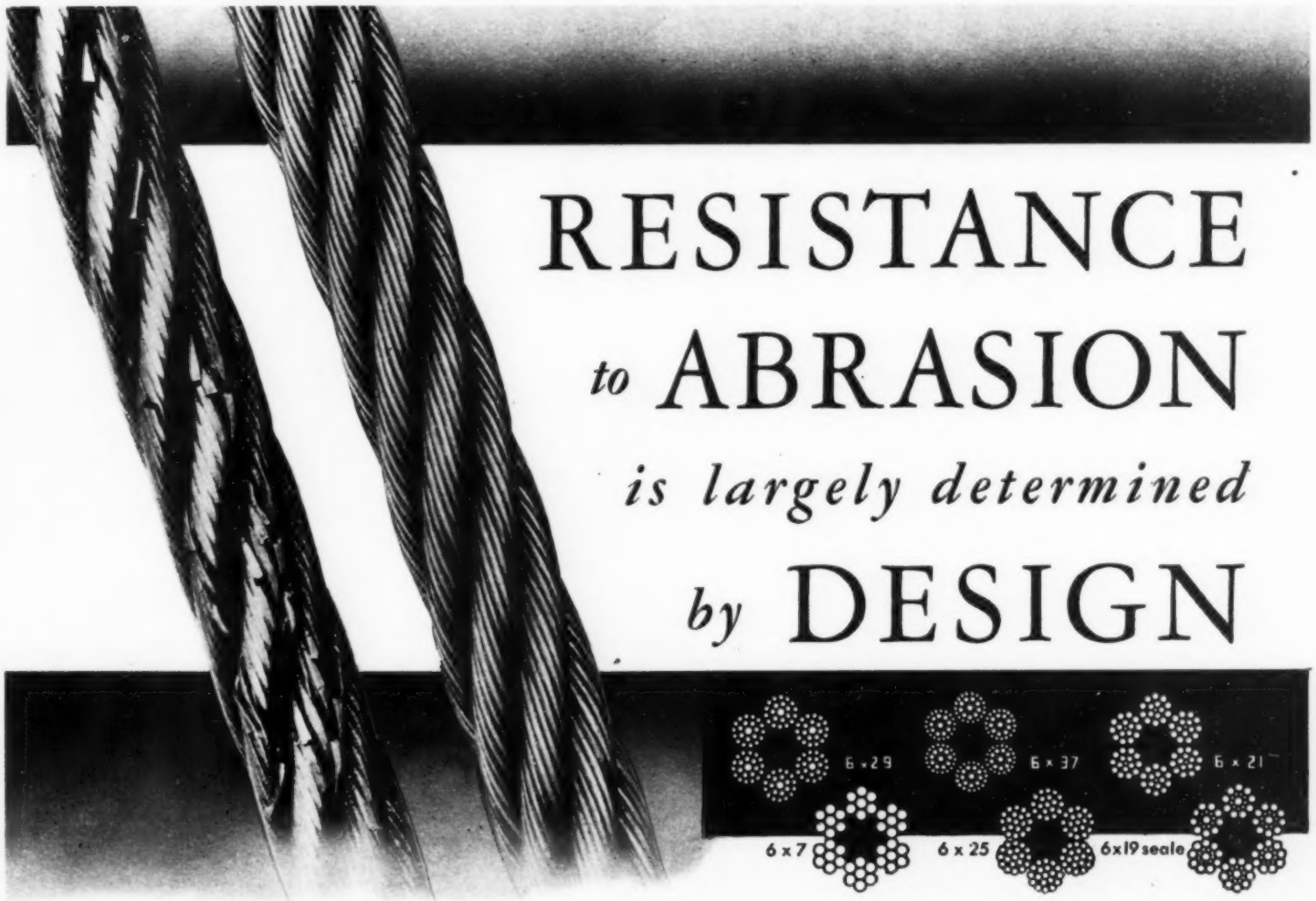
The "Caterpillar" Diesel Tractor is shattering cost records, boosting work-production figures. That's why it stands first today. It has set new standards for tractor power. It has brought a new basis for figuring bids and planning schedules. And it is first choice on the big jobs and the small—because it is first in performance, first in low operating costs, first in dependability and long life and low up-keep. Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

HARD FACTS ON THE SHOW-DOWN

A contractor on the Atlantic Gulf Canal reports: "Our two 'Caterpillar' Diesel Tractors haul an average of 85 cu. yds. of earth per hour on a 500-foot haul—entirely through deep sand. The cost is approximately 7 cents per cu. yd.!"

From an Iowa contractor: "With our 'Caterpillar' Diesel we haul 50% more material than with our gas tractors, and our hauling cost is cut in half."

CATERPILLAR DIESEL



RESISTANCE *to* ABRASION *is largely determined by* DESIGN

Select the Rope that Fits Your Job

When resistance to abrasion is the primary characteristic you demand in wire rope, select a rope with strands composed of few but heavy outside wires. Bear in mind, however, that the heavier the outside wires the less the rope is able to resist damage from bending. If wire rope in your particular service is subjected to both abrasion and frequent bending, it is wise to study the degree that each exerts as a destructive influence. The selection of a rope design that compromises resistance to abrasion with resistance to bending in the degree each occurs, will result in the longest possible rope life. Further information on this subject will be gladly sent to you upon request.

●

WICKWIRE SPENCER STEEL COMPANY, *General Offices:* 41 East 42nd Street, New York. *Sales Offices and Warehouses:* Worcester, New York, Chicago, Buffalo, San Francisco, Los Angeles; *Export Sales Dept.:* New York. WICKWIRE SPENCER SALES CORPORATION, New York, Chattanooga, Tulsa, Portland, Seattle.

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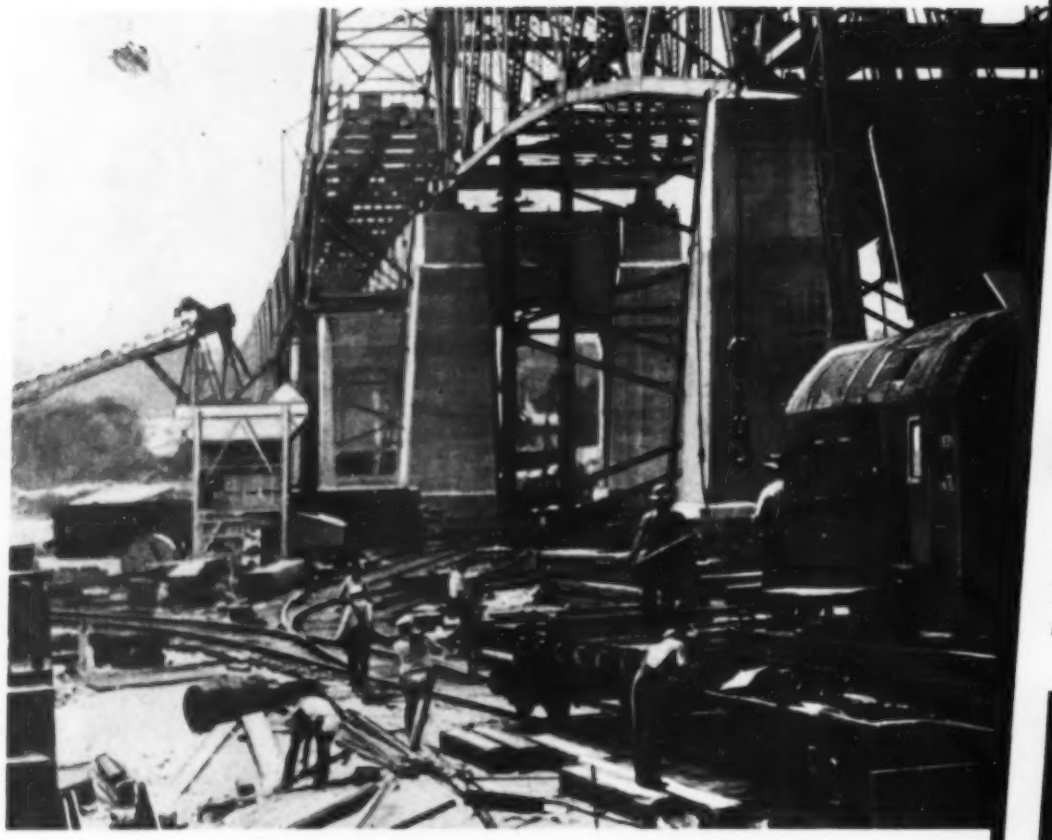
Spend 10 minutes to make this test



Marfak clings to bearing surfaces the way it clings to your fingers. It resists channeling. Ordinary grease channels and permits metal-to-metal contact.

An even better test is to smear a little Marfak on a smooth surface and then try to rub it off again. Compare it with any grease you have ever used.

In a grease-type universal, centrifugal force throws off most greases. Marfak has film strength . . . *load carrying* strength—because it contains heavy bodied dewaxed cylinder oils.

Under a revolving load, such as occurs in a bearing under rolling action, Marfak liquefies and supplies a fluid film, and seals the fluid film in the bearing.

Here's a "hand made" experiment that may save you many dollars

Try this . . . Take some Marfak in your hands . . . "Work" it around a bit. Then separate your palms. See how Marfak clings! Try these other simple tests shown at the right. Then try the same tests on the greases you are now using.

You'll quickly see the difference. And you'll want Marfak on all your equipment where a grease-type lubricant is needed.

Try it on the toughest lubricating "spots" on your heavy duty equipment—your trucks, for example. You'll find that it lasts longer, gives better lubrication, and provides greater protection from wear.

Get a can, or drum, and try Marfak *today.*

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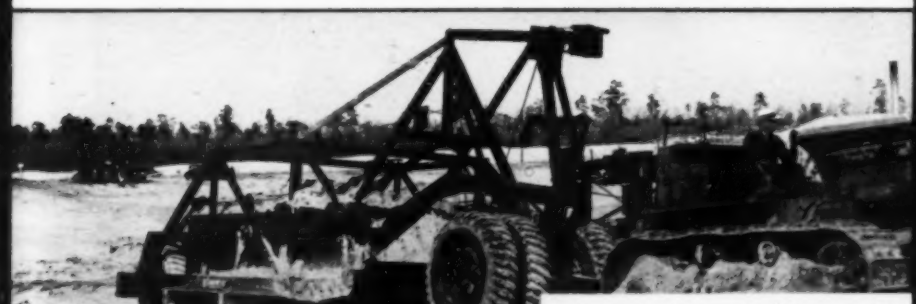
TEXACO

TEXACO *Industrial Lubricants*

3 FLORIDA CANAL CONTRACTORS CHOOSE LeTOURNEAUS

Benjamin Foster's Carryalls spoil-bank bound. For him, four 12-Yards have been moving 10,000 yards daily on a 650-foot one-way haul.

Hooper Construction Company moves heaped loads out a 12% ramp with the tractors in third gear. Average time for 1250-foot round-trip hauls is 7 minutes.



Foster puts the new Le Tourneau 24-Yard Carryall to work with a fleet that already included four Le Tourneau 12-Yards and a Le Tourneau Bulldozer.

C. G. Fuller's 12-Yard Carryalls make complete 1400-foot round-trip cycles out a 10% ramp in 5.9 minutes.

A Le Tourneau 12-Yard Carryall Scraper was the first mechanical unit to move earth on the Trans-Florida Canal. So well did it move the earth that three of the successful bidders on the Canal are now using Le Tourneau Carryalls, cutting costs as they cut this biggest of ditches through Florida sands. Their experience—more yardage at less cost—is typical of Le Tourneau performance the country over. Ask your tractor dealer to show you what Le Tourneau equipment can do for you.

R. G. LeTOURNEAU, INC.

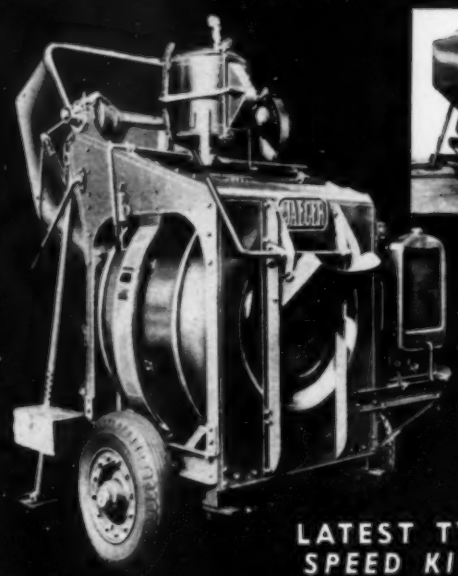
PEORIA, ILLINOIS **STOCKTON, CALIFORNIA**

Cable Address: "Bobletorno"

Manufacturers of: ANGLEDOZERS, BUGGIES, BULLDOZERS, CARRYALL SCRAPERS, CRANES, DRAG SCRAPERS, POWER CONTROL UNITS, ROOTERS, SEMI-TRAILERS

Over adverse grades of 14% on a round-trip haul of 2750 feet, this ingenious tandem hookup of two RD8's, the 24-Yard and 12-Yard Carryalls made complete cycles in periods ranging from 11 to 13 minutes, moving 30 yards to the trip.

LETOURNEAU



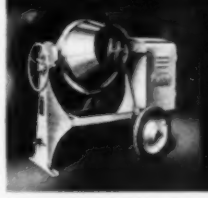
PNEUMATIC TIRES

TIMKEN BEARINGS

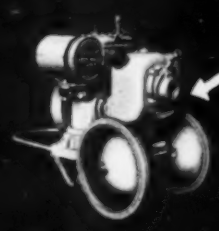
LATEST TYPE
SPEED KING

10S BRIDGE BUILDER

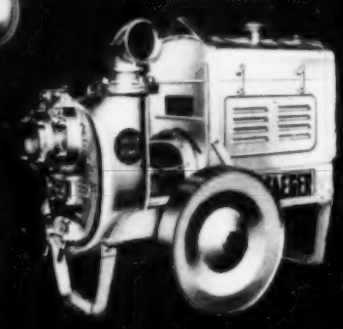
Now Faster Than Ever On the Road and On the Job!



Send for New Catalog of High Speed Mixers—3½S to 56S Sizes
THE JAEGER MACHINE CO.
800 Dublin Avenue, Columbus, Ohio



Lowest Price 7000 Gallon Pump Built



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8"-10" HEAVY DUTY MODELS

JAEGER "SURE PRIME" Means:

Fastest 100% Automatic Prime, Bigger Volume at any Lift

Our New Catalog Will Show You How to Cut Your Pumping Costs.
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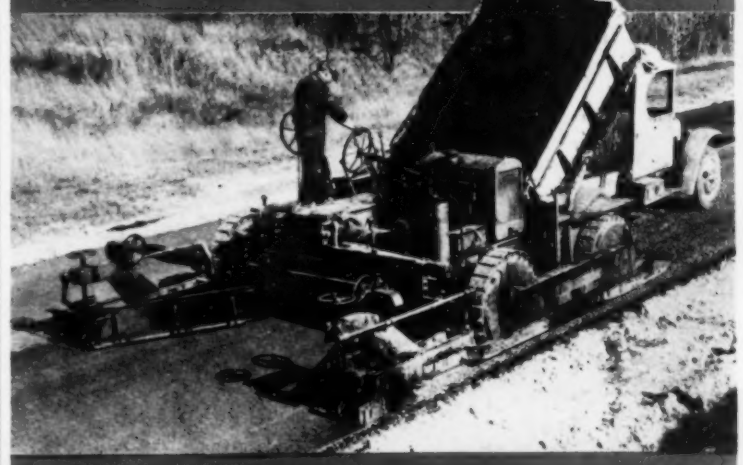
JAEGER Bituminous PAVER!



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1- Smoother Surfaces—carries own 18 ft. movable forms.

2- 50 Per Cent More Traction — semi-crawler wheels, 4 wheel drive, all on hard ground.

3- No Traction, No Weight on New Laid Materials — no tearing or rutting surface.

4- Adjustable — from less than 9 to 14 ft. widths.

5- Blends Perfect Joints—Fills Flush to Curb.

6- Capacity to 1000 Tons a Day—due to 25 ft. per minute finishing speed, wider widths.

7- Lays Hot or Cold Bituminous, Stone or Macadam.

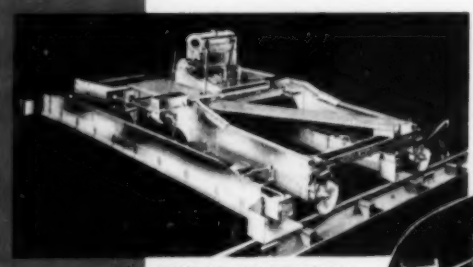
8- Greater Uniform Density — due to pug mill spreader, better screed action.

9- Cuts Costs — less hand finishing; bigger capacity, one man control.

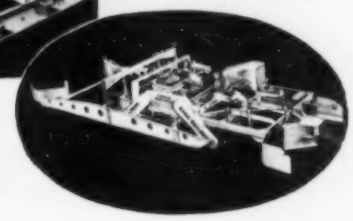
10- Takes Punishment — finest automotive construction thruout.

Send for New 56-Page Catalog—Gives all Details of This and other Latest Type Machines for Road Builders.

The Jaeger Machine Co.
800 DUBLIN AVENUE COLUMBUS, OHIO



JAEGER AUTOMATIC FINISHER
Flexible as steam—for highest type Bituminous or Concrete



TRIPLE PUG MILL ROADBUILDER
Mixes in One Pass—Better than 10 Bladings

to Get the Job—

and Handle It at

a Profit . . . .

FORGET *the* OLD STUFF!

Figuring with Rex Pumpcrete and Rex Moto-Mixers—now standard tools of the concrete industry—instead of old equipment, got the Milwaukee Filtration Plant Job—and made it a PROFIT job.

These 21,000 yards of concrete—handled for 15c less per yard—with most of it going into walls and floors from 3" to 5" thick—again proves "It Pays to Forget the Old Stuff."

Before moving it to this job, the owner of this Pumpcrete used it to pump concrete 105 feet in the air on malthouse construction.

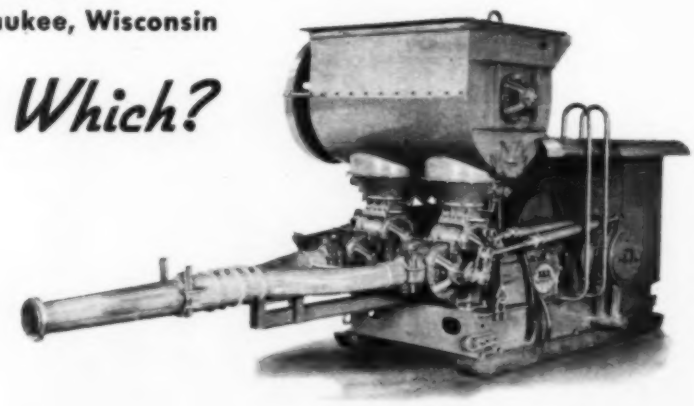
The Pumpcrete is an adaptable tool.

In 1936, before you buy, before you bid, investigate the Up-to-Date Methods of Handling Concrete.

CHAIN BELT COMPANY

1664 West Bruce Street **Milwaukee, Wisconsin**

Ask Us Which?



REX Moto-Mixers **REX Pumpcrete**

The Up to Date Methods of Handling Concrete

REX

CHAIN BELT COMPANY

Construction Equipment

GALION *Again Accepts* NATURE'S CHALLENGE

• • • • IT HAS FOR 30 YEARS

The nation's resources have been mobilized to relieve flood-devastated regions. The same relentless torrents that engulfed cities and towns recently also caused untold damage to streets and highways. This damage to roads by water followed the *regular* winter destruction of roads with which highway engineers are only too familiar.

Many new roads must be built . . . are being built now. Many must be repaired and rebuilt. Regular spring road maintenance operations are in full swing now.

Galion Road Machinery has built-in quality beyond what the eye can see. Trouble-free equipment is the result of this "extra quality" which goes into every Galion Grader, Roller, Planer, Road Drag, Rooter, Spreader and other Galion Road Machinery.

If you cannot say with certainty that your road building equipment is adequate . . . that it is efficient and economical . . . a consultation with experienced Galion engineers may point the way to profitable action. Inquire NOW.

THE GALION IRON WORKS & MFG. CO.
GALION, OHIO

Birmingham, Ala. ● Harrisburgh, Pa. ● Kansas City, Mo.
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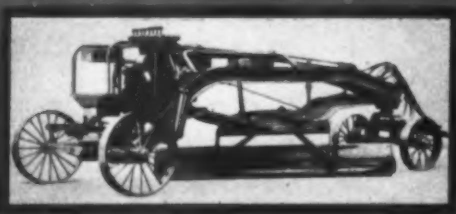
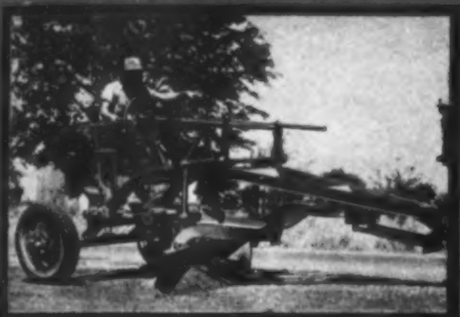
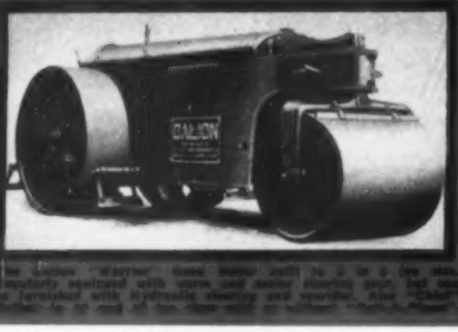
Distributors in Principal Cities







GALION

Cedar Point Road, Lucas County, Ohio. Tarvia-built in 1913 when automobiles were as rare as horse-drawn vehicles are today.

Twenty-three years of uninterrupted service is not an exceptional Tarvia performance record. Highway officials all over the country have had similar experiences with low-cost Tarvia pavement. They know that only the simplest and most inexpensive maintenance is needed to make a Tarvia road last indefinitely—always smooth, easy-riding and skid-safe. The Tarvia field man will give you details. Phone, wire or write our nearest office.

THE TECHNICAL SERVICE BUREAU
of The Barrett Company invites your consultation with its technically trained staff, without cost or obligation. Address The Technical Service Bureau, The Barrett Company, 40 Rector Street, New York.

THE BARRETT COMPANY New York Chicago Birmingham Philadelphia Boston St. Louis Cleveland Minneapolis Lebanon Milwaukee Detroit Baltimore Columbus Youngstown Toledo Buffalo Providence Syracuse Hartford Cincinnati Bethlehem Rochester Portland, Me. Norwood, N. Y. In Canada: THE BARRETT COMPANY, LTD. Montreal Toronto Winnipeg Vancouver

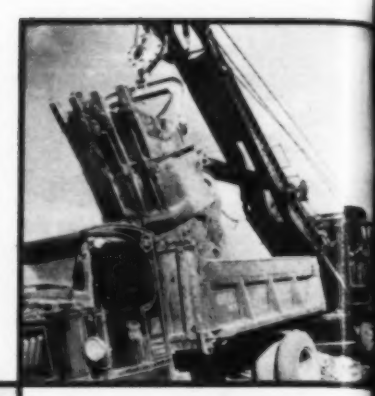
L

LORAIN-95

Left—A big capacity, long range dragline, clamshell, crane, on a crawler 18 ft. long.

1½ YD. LORAIN-77

Right—Diesel powered; Moves 10-20% more dirt, at 50-80% less fuel cost. Also 1¼ and 1 yd. models.



O

¾ YD. LORAIN-40

Capacities by Stability and Strength, not Weight. Honest ¾ yd. dipper and real ranges at 33,000 lbs. weight. Also ⅝, ½, ⅜ yd. models . . . Below, single purpose, easy-loading trailers for L-40-37-30-27's.

R

2-Yard LORAIN-87

Look at the front end of the L-87—it's the greatest advancement in shovel booms since the shipper shaft boom. In it, boom column stresses and torsional stresses are handled each independently of the other—and being scientifically designed for these *known* stresses, it cannot help but be the strongest front-end ever offered—And, of course, it's Center Drive to give you greater ranges. Find out why other similar, outstanding features of the L-87 make it the answer to the existing need in the 2-yd. field for faster, cheaper dirt-moving.

THE THEW SHOVEL CO.
LORAIN, OHIO

A

Clamshells

With clamshell bucket, a Universal truck crane is a fast, economical way to dig footings, cellars, trenches; to unload cars, charge bins, load trucks—Truck mobility permits its use on a 2 hr. or 200 hr. job.

Shovels

Now a full size ¾ yd. shovel that gets to the job as fast as a truck. For basements, borrow pits, ditches, road slides and slips, light grading. A cost-cutter on small, scattered jobs. Capable of turning out real yardage on the job.

All the truck shovels and cranes on this page are part of the fleet of 21 built up by Elmhurst Contg. Co., Corona, L. I., N.Y., to take care of Crane Service demands. There is always work on every contract—big or little—that can be done more cheaply, more quickly, with a Universal. It may be a 200 hour, or a two hour job of digging, material-handling or steel erecting. .... Universals get to these jobs at truck speed with just the correct boom equipment—crane, clam or shovel. Elmhurst's fleet of Universals has been built up by offering such cost-cutting, time-saving Crane Service—then, by producing results with reliable Universals. That Elmhurst has purchased 21 Lorain-40's in the last 15 months is proof of the service you can expect from Elmhurst and Universal-Lorains.

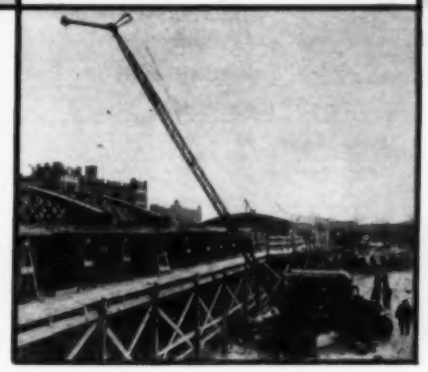
THE UNIVERSAL CRANE CO.
LORAIN, OHIO

I

Cranes

With any boom length from 25 to 60 ft. long—gooseneck booms available—Crane capacities of 6½ to 8½ tons—Adaptable to the fast, economical handling of any crane job—unloading and setting steel, handling tanks, pile driving, or general lifting service.

N

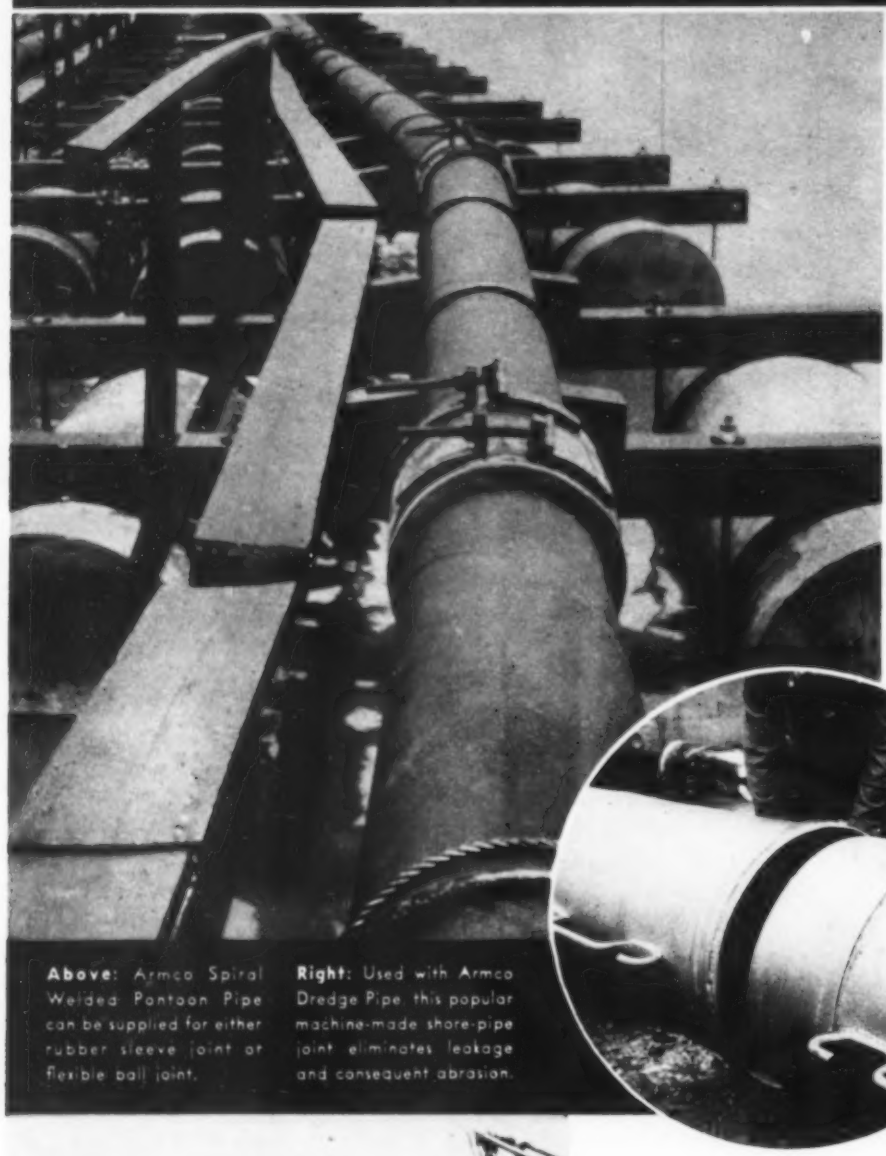


The Greatest Specification

THEW CENTER DRIVE

a Shovel or Crane Can Have

FOR
PROFITABLE DREDGING
use Armco Dredge Pipe



Above: Armco Spiral Welded Pontoon Pipe can be supplied for either rubber sleeve joint or flexible ball joint.

Right: Used with Armco Dredge Pipe this popular machine-made shore-pipe joint eliminates leakage and consequent abrasion.

If ever a pipe was made to order for your dredging contracts, it's ARMCO *Special Analysis* Dredge Pipe. Like Armco Pipe for water lines and industrial uses, this type is also spiral welded for greater strength—only it's made of a tough, abrasion-resisting steel.

Listen to what an old-time dredge captain says of Armco Dredge Pipe . . . "the tightest shore-pipe joint I ever saw, and the easiest to lay and break out."

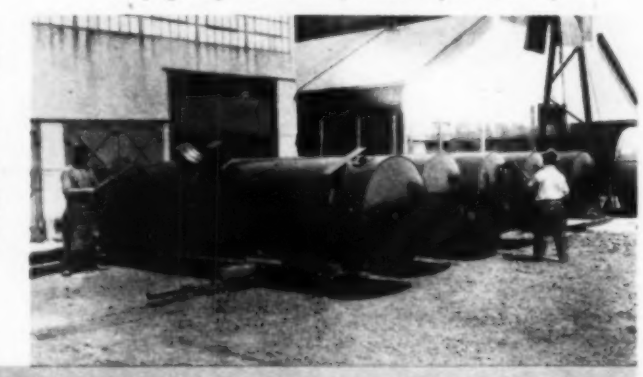
That's because Armco shore-pipe joints are precision-made by machine. And Armco Spiral Welded Dredge Pipe is "balanced," rolls handily and speedily to position. Diameters run from 6" to 36", wall thicknesses from ⅛" to ½".

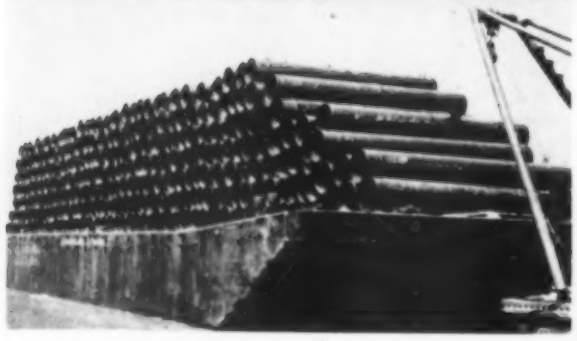
Besides the shore type, there is also Armco Pontoon Pipe — long lengths of tremendous strength and endurance that weather rough water and stand up under wear and tear. And for pontoons, you can use durable ARMCO Ingot Iron, or Steel, made complete in various sizes with special saddles and brackets to your specified design.

Just send your specifications to us—or write for full information. The American Rolling Mill Company, Pipe Sales Division, Middletown, Ohio.

•

Below: Pontoons made of durable Armco Ingot Iron keep giving satisfactory service year after year.





This buyer's Armco dredge pipe was delivered direct by barge to the site.

Profit Points on ARMCO DREDGE PIPE

★

Extra abrasion resistance • Extreme high strength • Reduced pumping costs • Strong tight-fitting joints.

ARMCO

ARMCO DREDGE PIPE

Don't tie your money up in a one-purpose machine!

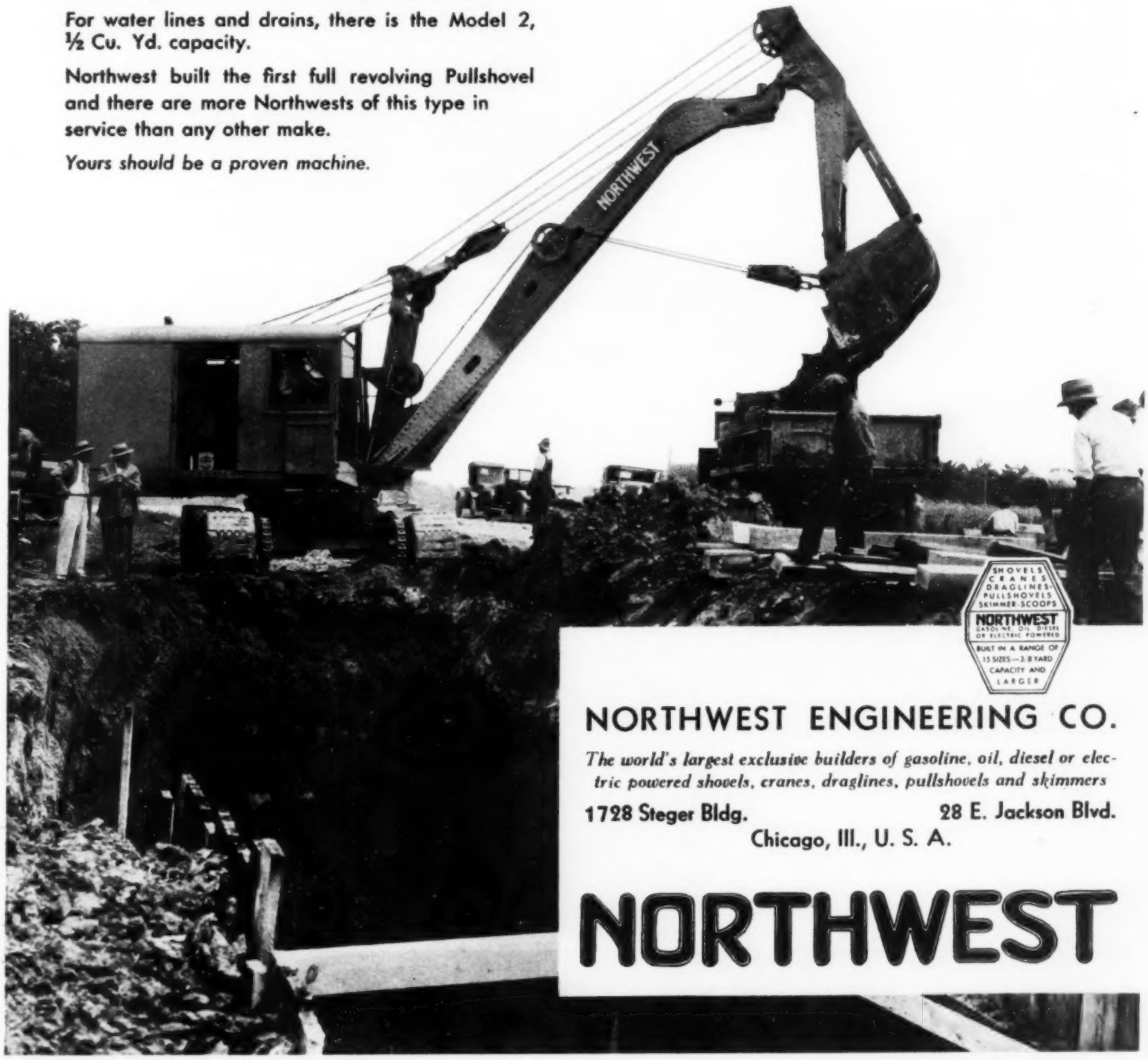
THE Northwest Pullshovel is more than a trenching machine. It is an all-purpose unit that answers the problem of the sewer contractor today and is ready for other work as a shovel, crane or dragline tomorrow.

It handles depths up to 27 ft., cuts a straight walled trench and loads to trucks with ease, meeting the low clearances necessary in streets and alleys.

For water lines and drains, there is the Model 2, ½ Cu. Yd. capacity.

Northwest built the first full revolving Pullshovel and there are more Northwests of this type in service than any other make.

Yours should be a proven machine.



NORTHWEST ENGINEERING CO.

The world's largest exclusive builders of gasoline, oil, diesel or electric powered shovels, cranes, draglines, pullshovels and skimmers

1728 Steger Bldg. 28 E. Jackson Blvd.

Chicago, Ill., U. S. A.

NORTHWEST

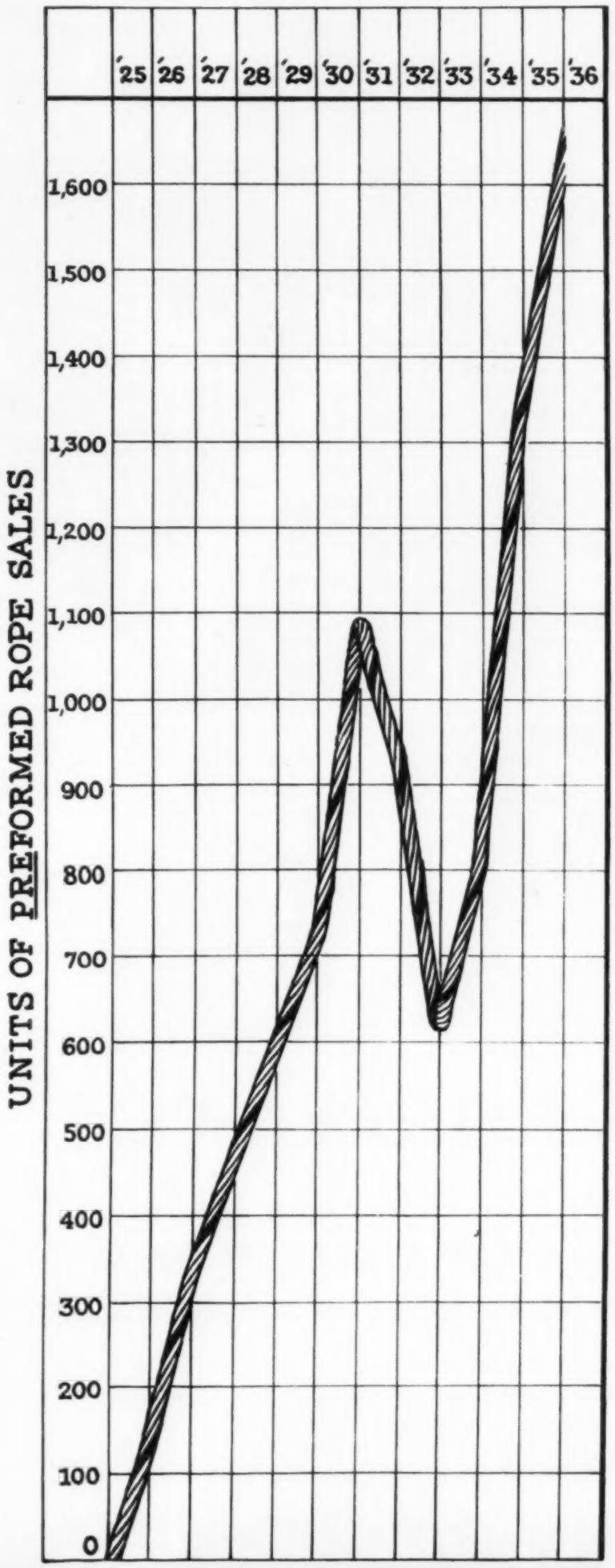
The Koehring Wheel Dumptor
for hauling · dumping · spreading

Proven Performance

—in quarry operation for stripping work. 4 of a fleet of 7 Koehring Dumptors hauling and dumping the over-burden at costs lower than any previous method. Front dump, eliminating time-consuming backing and turning, greatly increases production. Repeat orders for this type of work are proof of the efficient and economical performance of Koehring Dumptors.

The automatic kick-out pan insures a clean and speedy dump for any type of material. The load is instantaneously dumped by force of gravity, without mechanical complications.

KOEHRING COMPANY
Pavers · Mixers · Shovels · Cranes · Draglines · Dumptors · Mud-Jacks
3026 WEST CONCORDIA AVENUE, MILWAUKEE, WISCONSIN



TRU·LAY's ACCEPTANCE

since 1924

GREEN SIGNIFIES SAFETY

TRU-LAY Preformed wire rope was introduced to American industry in 1924. It represented the first basic improvement in wire rope in nearly one hundred years.

The preforming process made a superior rope . . . a rope which commanded widespread attention and rapid acceptance. In units of sale the graph shows exactly the degree of this acceptance. As you look at the chart please remember that this phenomenal rise was attained in spite of a premium price and the business depression.

Today TRU-LAY Preformed is the accepted standard of excellence in wire rope for literally thousands of rope users. Under our exclusive patents 78 wire rope manufacturers throughout the world are now licensed to make and sell preformed rope. Without exception these licensees are feeling the rapidly growing demand for preformed rope. TRU-LAY Preformed is one of the outstanding successes in recent industrial history. You, too, will find it pays to specify TRU-LAY Preformed.

AMERICAN CABLE COMPANY, Inc.
Wilkes-Barre, Pennsylvania
An Associate Company of the American Chain Company, Inc.

In Business for Your Safety

District Offices: **Atlanta, Chicago, Detroit, Denver, New York, Philadelphia, Pittsburgh, Houston, San Francisco**

TRU·LAY *Preformed* Wire Rope

ALL AMERICAN CABLE COMPANY ROPES MADE OF IMPROVED PLOW STEEL ARE IDENTIFIED BY THE EMERALD STRAND

The RIGHT ONE of these is Best for the Job

Development of control has modernized the use of explosives to give a high degree of precision. Atlas provides the explosive with the right force for every type of blasting.

Consult the Atlas representative whose knowledge and experience will aid you in selecting the explosive with the right strength, velocity and other qualities best adapted to *your* job.

ATLAS POWDER COMPANY, WILMINGTON, DEL.

Cable Address—Atpowco

Everything for Blasting

OFFICES

Allentown, Pa.	Joplin, Mo.	New Orleans, La.	Pittsburgh, Pa.	Spokane, Wash.
Boston, Mass.	Kansas City, Mo.	New York ,N. Y.	Portland, Oregon	St. Louis, Mo.
Butte, Mont.	Knoxville, Tenn.	Philadelphia, Pa.	Salt Lake City, Utah	Tamaqua, Pa.
Denver, Colo.	Los Angeles, Calif.	Picher, Okla.	San Francisco, Calif.	Wilkes-Barre, Pa.
Houghton, Mich.	Memphis, Tenn.	Pittsburg, Kansas	Seattle, Wash.	

ATLAS

EXPLOSIVES

CHEMICALS ATLAS EXPLOSIVES

Los Angeles street showing Atlas White Traffic Marker after three years' wear. Marker installed by Inlay Marker Co., Long Beach, Cal., under supervision of the City Engineer, Los Angeles

. . . *cautions this white concrete marker*

WHITE concrete markers make good traffic cops. Good—and tough. They help keep traffic on the safe side. . . . Funny the respect people have for a straight white line!

The traffic marker of Atlas White shown in the picture has been on the job for over three years. And it will stay there—as white and efficient as it is now—as long as the pavement lasts. For Atlas White traffic markers are a permanent part of the pavement—built right into the asphalt, brick, or concrete.

They're made of solid white concrete, with a dense, solid, hard, white surface that *stays* white. Once installed, they're in for good. They never wear away, never fade out, never have to be replaced. There is no maintenance cost. Their first cost is their last cost. They're always on the job.

If you'd like to know more about these economical safety markers write—

UNIVERSAL ATLAS CEMENT CO.
UNITED STATES STEEL CORPORATION SUBSIDIARY
208 South La Salle Street • Chicago

Help Build Safety into Streets and Highways with Atlas White Traffic Markers • Made with Atlas White Portland Cement • Plain and Waterproofed

M-7

ATLAS WHITE TRAFFIC MARKERS

Construction Methods

ROBERT K. TOMLIN, Editor

Established 1919 — McGraw-Hill Publishing Company, Inc. Volume 18—Number 4—New York, April, 1936

Mobile Belt Conveyors Handle Earth for

FLORIDA SHIP CANAL

A MOBILE BELT CONVEYOR system about 800 ft. long is moving and stacking earth at the rate of 12,000 cu.yd. per day near Ocala, Fla., for the Harvey-Ray-Noonan Construction Co., contractor for 2,000,000 cu.yd. of excavation on one section of the Florida ship canal. Powered by electric motors and equipped with anti-friction idlers, the main horizontal conveyor carries a continuous stream of earth to a pivoted stacking conveyor, with a boom 85 ft. long, which builds a spoil pile 45 ft. high along one bank of the canal. Two rolling hoppers on the rigid truss framework of the horizontal conveyor feed earth to the belt. The hoppers are filled by two 2½-yd. electrically powered draglines equipped with 50-ft. booms.

One-half of the width of the canal is excavated at a time, the remaining half being excavated on the return trip of the conveyor system. As indicated by the upper photograph, the horizontal conveyor stretches transversely across the top of half the canal section, resting on natural ground at the advancing edge of the cut. Steel rails laid parallel with the center line of the cut support the wheel trucks on which the conveyor system moves forward with the aid of tractors. The complete excavating plant, including both conveyor and draglines, was built by the Link-Belt Co.

This Month's "NEWS REEL"

COFFERDAM DEMOLITION is accomplished by big blast to remove section of upstream crib structure within which construction has been proceeding at the Bonneville dam on the Columbia River in Washington. The main contract for the concrete spillway dam, 1,250 ft. long and 170 ft. high, is being executed by the Columbia Construction Co., under direction of the U. S. Engineer Department.

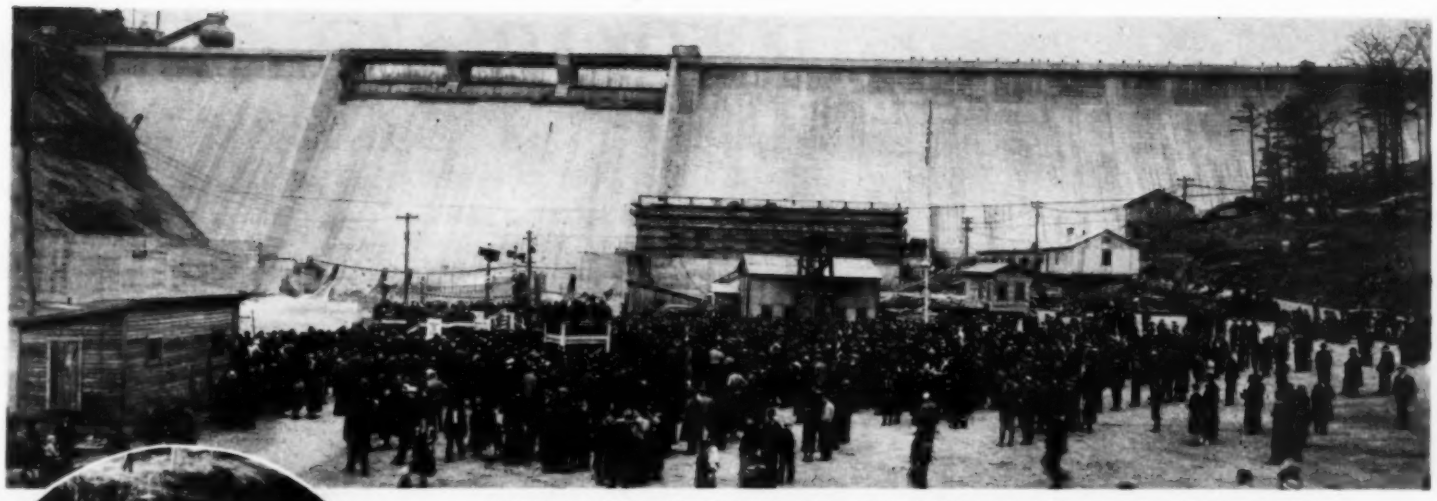
FEDERAL FUNDS FOR VEHICLE TUNNEL under East River, New York, are authorized in form of PWA grant of $11,235,000 and loan of $47,130,000, to be repaid by toll charges. Notification of approval of project is received by *(seated, left to right)* Arthur S. Tuttle, PWA state engineer for New York and Albert B. Johnson, New York City Tunnel Authority chairman; *(standing)* Mayor F. H. LaGuardia *(at extreme left)* and U. S. Senator Robert F. Wagner *(at extreme right)*. Standing next to Senator Wagner is Ole Singstad, chief engineer of the Tunnel Authority.

NEW FOUR-LANE HIGHWAY across crest of Boulder dam, completed and accepted by the Federal Government from Six Companies Inc., March 1, supplies traffic link across Colorado River between Kingman, Ariz., and Las Vegas, Nevada. In foreground are tall intake towers and in background Arizona spillway.

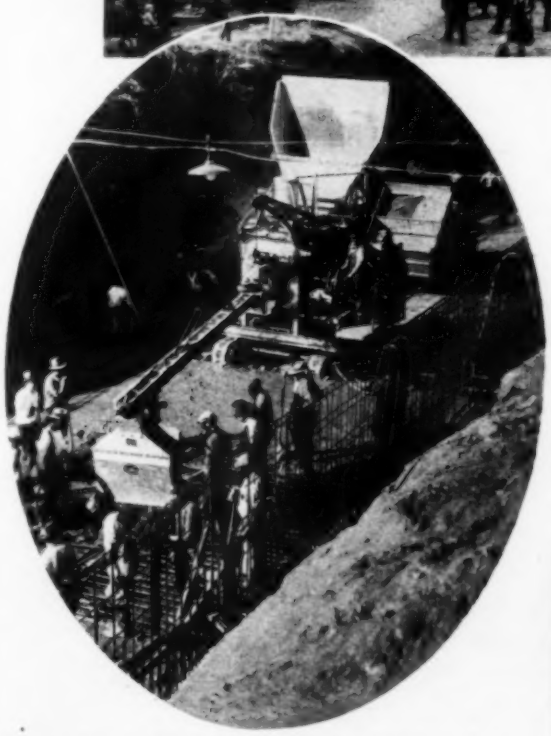
U. S. Bureau of Reclamation Photo

FLORIDA SHIP CANAL EXCAVATION is handled by Bucyrus-Monighan walking dragline dumping spoil upon Chambers combination bridge and car transporter supported by mobile A-frame unit. Dragline bucket discharges into hopper feeding 10-yd. transporter car.

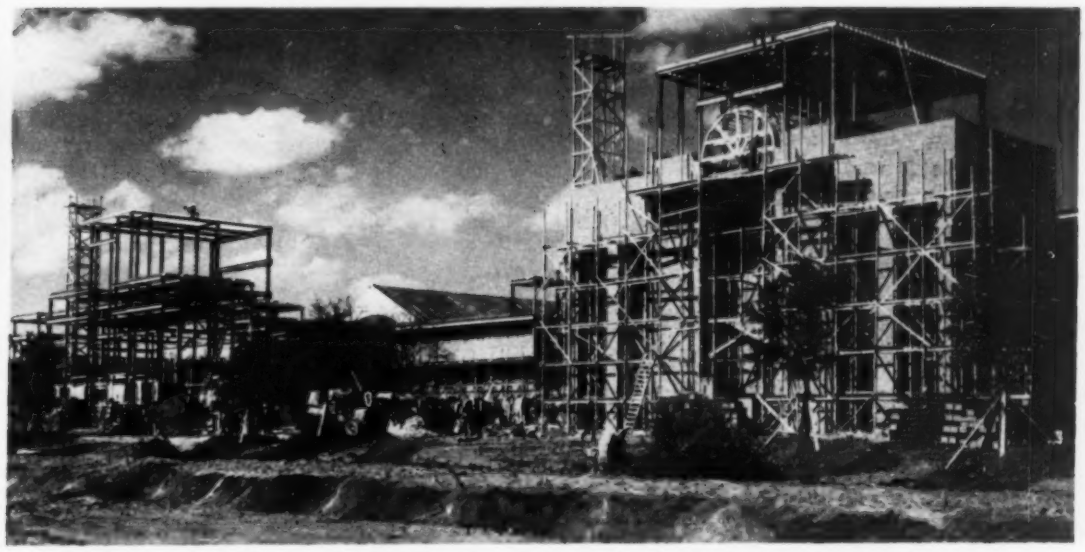
Aims Photo



NORRIS DAM WATER STORAGE STARTS March 4, after President Roosevelt, in Washington, presses gold telegraph key which gives signal for closing sluice gates on Tennessee Valley Authority project on Clinch River, 20 mi. northwest of Knoxville, Tenn. Norris Lake will have capacity to impound 2,570,000 acre-ft. of water. Dam, designed by U. S. Bureau of Reclamation, is of concrete, 1,872 ft. long and 266 ft. high; it contains 1,195,000 cu.yd. of concrete.



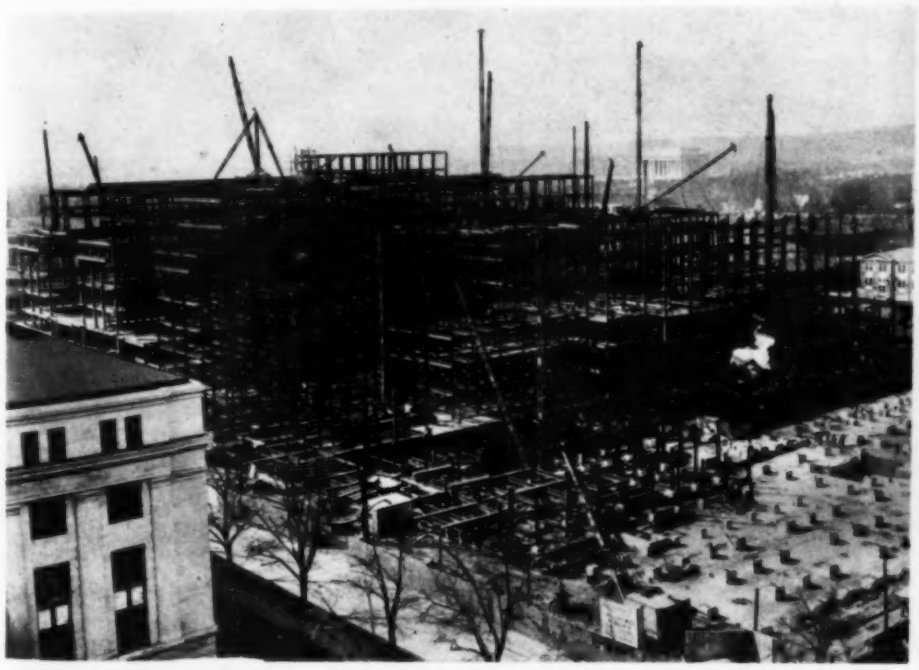
FLOOD CONTROL CHANNEL *(above)* in Los Angeles County, Calif., under supervision of U. S. Engineer Department, is being paved with Ransome concrete mixers equipped with extra-long 50-ft. booms and special buckets. The work is proceeding under a $14,000,000 allotment for clearing and lining channels, protecting banks and building debris basins.



BUILDINGS FOR TEXAS CENTENNIAL are rapidly taking form. Work is being expedited to complete 18 major structures before opening World's Fair at Dallas, June 6. View shows Hall of Varied Industries covering ground area of 750x300 ft. and erected in three sections by Central Contracting Co.

ICKE'S "ANNEX" *(below)* Steel erection, involving 12,000 tons, nears completion on new $10,000,000 building in Washington, D. C., for Department of the Interior. General contract for the structure, to be faced with Indiana limestone, is held by George A. Fuller Co., of Washington, D. C.

Harris & Ewing Photo



CHICAGO'S SOUTHWEST INTERCEPTING SEWER is part of $56,000,000 PWA construction program directed by W. H. Trinkhaus, acting chief engineer, Sanitary District of Chicago. Bore 17 ft. 6 in. wide and 19 ft. 2 in. high is being tunneled through blue clay and hardpan. Temporary steel lining resting on H-columns gives support until permanent concrete lining is placed. Pneumatic shovel loads muck.

PWA Pushes Cleveland

TOWER-PAVER UNIT batched by trucks mixes and delivers concrete to hopper from which material is distributed by wheelbarrows to wall and column spread footings.

between Jan. 7 and March 11, 1935. A maximum of about 100 men was employed at any one time on this work.

Following the start of excavation for the new housing on June 24, 1935, the George A. Fuller Co., general contractor, concentrated on the buildings immediately adjacent to the heating plant. Excavation actually started first on block V and on the heating plant. These were followed in rapid succession by blocks H, L, M, R, S, T, Q, and G. Blocks O, N, K, J, E, F, D, B, C and A-1 and A-2 were handled in the order named. Two shifts, employing between 15 and 30 men altogether, did this work, moving approximately 33,000 cu.yd. of earth between June 24 and early September, using one 1¼-yd. power shovel. Block H was the first to be put under cover—during the week ending November 23.

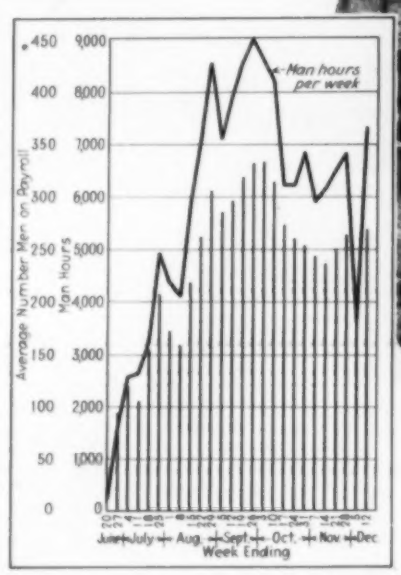
Until the end of November, 1935,

CLEVELAND'S CEDAR - CENTRAL slum-clearance project, the sixth low-rent housing job in PWA's $150,000,000 program, and the third actually to get under way, is rapidly assuming shape. With an allotment for this project of $3,279,000, badly deteriorated housing with an assessed valuation of $305,140 on 18¾ acres of land assessed at $195,150 has been torn down and is being replaced with 654 modern, well-designed, well-lighted living units. All streets within the area have been eliminated.

The new housing, scheduled for completion Aug. 18, 1936, consists of 23 three-story brick, fireproof, walk-up apartment buildings of functional architectural arrangement containing 8 two-room, 354 three-room; 226 four-room, and 66 five-room dwelling units, a total of 2,312 rooms. Added to these buildings will be 9 one-story stores, 80 garages, 82 incinerators, and a central heating plant housing two 250-hp. boilers. Each apartment building has a full basement with laundry, drying rooms and space for play, club rooms and work shops. A 120-ft. radial-tile chimney alongside the heating plant towers high enough above the top floors of the houses to avert all unpleasantness and danger of noxious fumes.

175 *Buildings Razed*—Demolition of the existing buildings was let in two separate contracts—both to George L. Sogg (Cuyahoga Wrecking Co.) of Cleveland. Seventy-five houses were torn down between Nov. 26, 1934, and the following Jan. 15, under the first contract. One hundred houses came down on the second contract—

LABOR CHART (*right*) indicates average numbers of men at work by vertical bars and man-hours per week by curved line.



SEVERITY (*below*) of functional architecture is relieved by variety in face brick, balconies and casement windows.

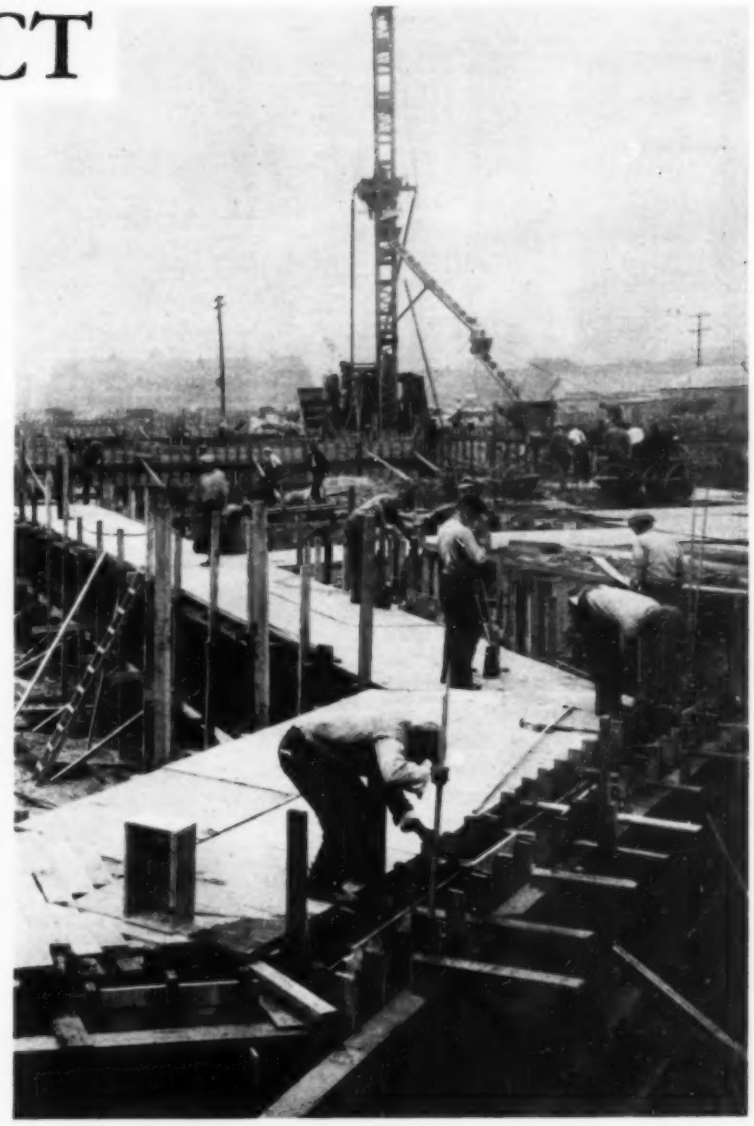
HOUSING PROJECT

unusually good weather helped to speed construction and compensate to some extent for delays occasioned by such items as the special foundation work required in spots to bridge or drive beneath wells, ex-bootlegger caches, existing sewer lines and other underground utilities, where the average 5-ft. depth of wall (below ground level) was not sufficient. Concrete spread footings have been used throughout the area, supporting concrete foundation walls of 1-ft. thickness and interior building columns.

Progress—About 2 weeks per building is required for roughing in plumbing, heating, wiring and mechanical equipment; 2 days per story for handling brick work and setting steel casement windows; and 1 day per floor to place concrete.

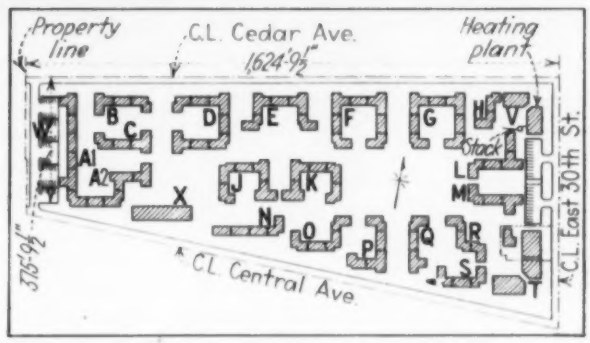
With the exception of the double shift of 30-odd men used between June and September on excavation, a single shift, observing a 30-hr. 5-day week has been employed on the project. Daily employment totals have grown from the handful on the job in late June to about 300 in December. Ultimately it is expected that about 600 men will be on the work, exclusive of those hundreds indirectly engaged in manufacturing materials and supplies.

Material Handling Methods—Two Ransome mixers have been kept busy on the job. A 1-yd. tower-paver unit mixes concrete on the ground and elevates it by mast hoist to a chute line which, in turn, delivers the mixture to a hopper on the floor being placed.



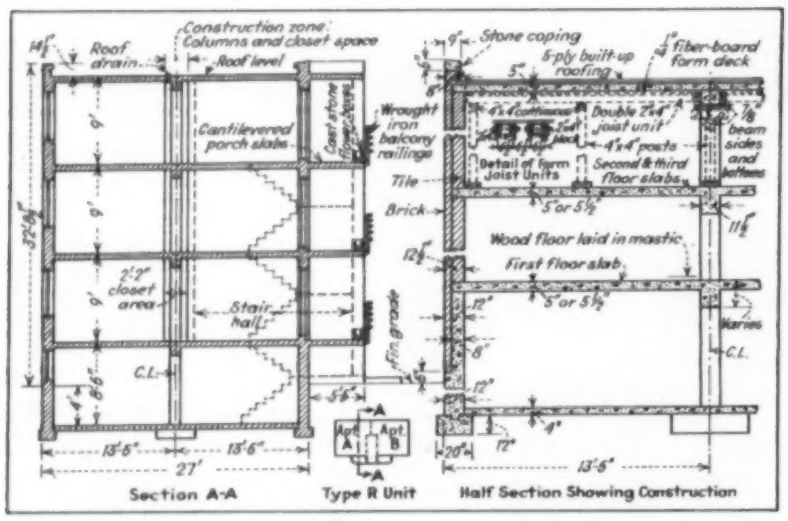
BUGGY RUNWAYS (*right*) on pole scaffold transport concrete from deck hopper to wall forms. Tower-paver unit is moved to each concreting site as required.

TWENTY-THREE APARTMENT HOUSES (*left*) containing 654 dwelling units of 2,312 rooms rise on 18¾-acre Cleveland site formerly occupied by unhealthful tenements. Basement walls of concrete are to be faced with brick above finished grade.



23 PER CENT COVERAGE of land with population density of 120 per acre is selected as best compromise between desired spaciousness and required low-rent economy.

TOWER HOIST and horse scaffolds aid bricklayers in building exterior walls of hollow clay tile faced with variegated brick.



APARTMENT-HOUSE SECTIONS indicate standard building design and details of footings, walls, floors and formwork.

Two-wheeled "buggies," filled from this hopper, distribute the concrete. Electrically-operated vibrators consolidate the concrete against Masonite forms. A smaller ½-yd. mixer has been used in constructing foundations. Here the concrete is distributed from the tower by chutes directly to the forms. The concrete mix is controlled to give a 28-day compressive strength of 2,000 lb. per square inch. In no case may the water-cement ratio exceed 7¾ gal. per sack (94 lb.) of cement.

Sand, gravel, cement, lumber, tile, brick and steel are unloaded beside each building, as required. Construction roads extending throughout the area reach all of the 23 apartment buildings.

Forms—Because the concrete ceilings are to be left exposed, except for painting, it is necessary to build forms which will leave as smooth a finish as possible. Sheets of Masonite, resting on specially-built joist units, have proved satisfactory. As shown in an accompanying sketch, a joint unit 12 ft. long made up of two 2x4's spaced on 6½-in. centers and securely bolted together spans three rows of shores and supports the Masonite sheets. As all the buildings are 27 ft. wide, three 4-ft.-width Masonite sheets are almost an exact fit from exterior wall to center girder in each half of the building. The shores and forms are handled easily by one man, are set up and taken down quickly, and are used repeatedly. With this type of support for the concrete floors, tight decking has been found unnecessary.

Quantities — Construction of the buildings and completion of walks and drives and recreation areas will require 4,000,000 brick, 300,000 sq. ft. of back-up tile, 1,500 tons of reinforcing steel, 6,000 ft. of limestone copings, 584 cast-stone flower boxes, and 300,000 sq.ft. of Spray-on damp-proofing for foundation walls. Storage of materials at the site has been held to a minimum, as the buildings are readily accessible to truck deliveries.

Altogether, the project calls for about 33,000 cu.yd. of general excavation, 72,000 sq.yd. of surface grading and 6,000 sq.yd. of recreational surfacing. Sidewalks and concrete driveways require 126,000 sq.ft. of concrete.

FORM JOIST UNITS spanning floor opening in lower left foreground will carry ¼-in. fiber-board decking on which concrete floor will be cast.

Building Details—All the housing units are 27 ft. in width. Apartments are two rooms wide with cross-ventilation. Center column construction, using center beams under which are concentrated such storage spaces as are to be provided in closet areas, is being used throughout. The only steel in the project (outside of the concrete reinforcement) is in lintels and stair frames. Roofs are flat and are covered with five-ply built-up roofing and asphalt-gravel surfaces.

Walls are of hollow-tile construction incorporating 8x8x12-in. L-shaped load-bearing tile especially designed for the job by the National Fireproofing Co. to take care of brick header courses, providing a space for the header brick and at the same time presenting an unbroken tile surface on the inside of the wall. Walls are faced with variegated brick ranging from light terra cotta to dark red. Space between the brick and the back-up tile is slushed solid as each course is laid.

Partitions in all the buildings with the exception of the central heating plant consist of 2-in. solid plaster on metal lath. Maple floors, laid in mastic, are specified. The all-metal Truscon casement windows have aluminum outside sills. Metal jambs have been used throughout the buildings, without plaster. There are no corridors, each floor being organized around compact central stairways and small landings, the walls of which are faced with glazed tile.

Steam from the central heating plant will be supplied at 25- to 30-lb. pressure through underground mains. Reducing valves in each building will deliver this steam at 2-lb. pressure through a two-pipe system to the room radiators, and at 5 lb. to the heat exchangers, which will supply hot water to the tenants.

All cold- and hot-water return lines within the buildings use hard-tempered copper tubing. Electric wiring is in rigid steel, zinc-coated conduit. Current will be supplied by a local utility from a nearby substation.

Design Principles — Several basic principles were laid down in the preliminary studies of the Cedar-Central project.

First, the coverage of land by buildings should be held to a minimum. Bearing in mind that reducing the coverage and therefore the density of population per acre below a certain point brings about a rapid increase in the rent, a coverage of 23 per cent and a density of 120 people per acre was fixed because the curve of rental rates begins to rise rapidly below this number.

Second, the monotony of design too often found in the row-type plan, particularly in European housing projects, should be avoided. Varied arrangements of units has been achieved through a combination of three simple sections—an "L," a "T" and a so-called "ribbon." Combined in a variety of layouts, these sections have made it possible to develop maximum utilization of space in each apartment while at the same time organizing a general grouping plan which affords unusual distance between facing walls, with the greatest possible amount of natural light and air.

Third, a feeling of openness in the apartment itself should be provided by the relation of units within the plan. To attain this sense of spaciousness all apartments look out into gardens on two exposures. The living room has its long axis parallel to a garden area. There is a wide opening between the living room and the kitchen-dining space, and adjacent, either to the living room or to the dining space, is a 6x12-ft. porch, which provides an additional room during warm weather—to be used for dining purposes or for a play space for small children under the eyes of the mother. These three areas with the two garden exposures provide a feeling of space and openness not often obtained even in a single house.

The arrangement of buildings, the varying sizes and shapes of the courts, the selection of a brick with texture and color variations, the introduction of balconies with iron railings and flower boxes as accents and the use of different colors on window frames, railings and entrance doorways of opposing buildings add interest to an otherwise plain architecture.

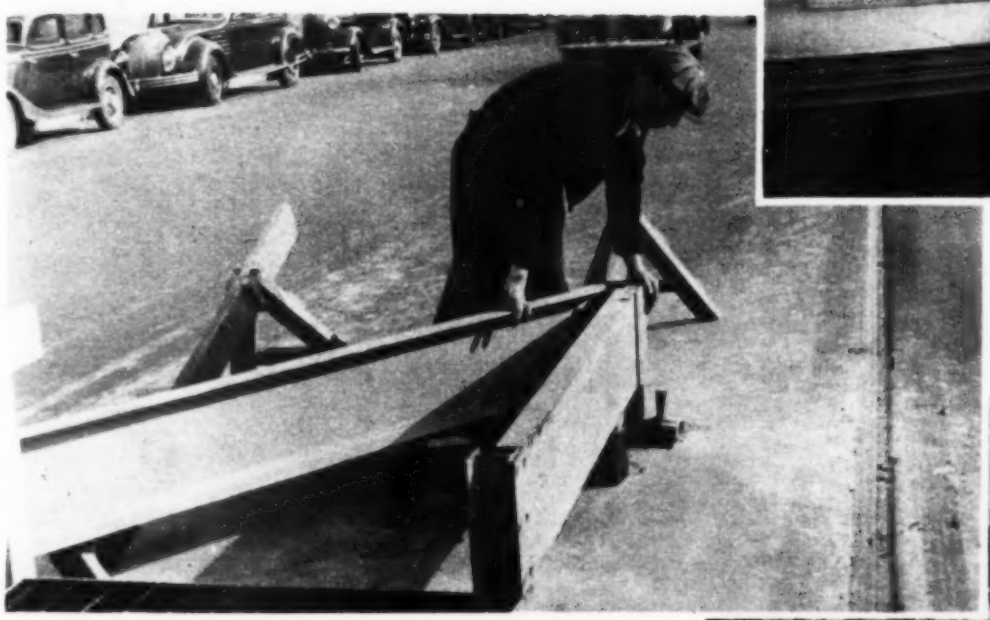
WALL DETAIL. Header brick lock into space provided by special L-shaped back-up tile.

Personnel—Walter Ray McCornack is the architect, and George L. Craig is project manager for PWA. For the George A. Fuller Co., general contractor, Frank E. Warren is construction manager. A. R. Clas is head of the Housing Division of PWA, and F. J. C. Dresser is Cleveland district manager.

Step-by-Step Field Methods

Detroit Erects Safety Platforms for Woodward Avenue Trolley Passengers

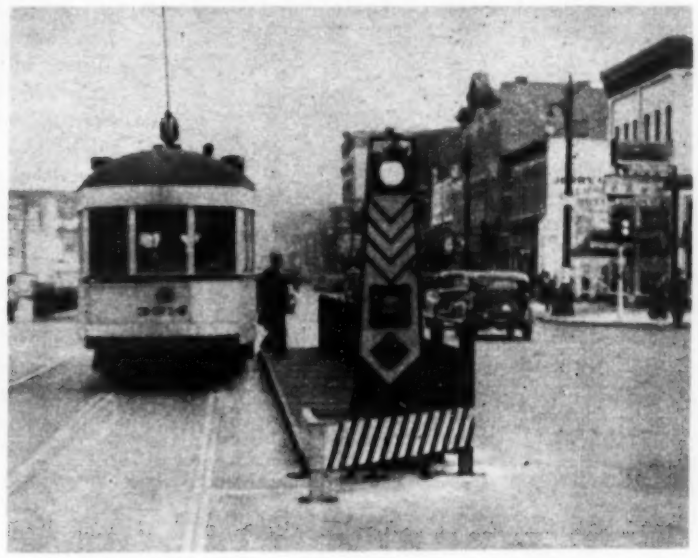
1 WIDENING OF WOODWARD AVE., Detroit's main thoroughfare, has caused motor traffic to increase speed to such a degree that old "button-and-stripe" safety zones for street-car riders no longer give adequate protection. Passengers stepping from street cars keep uneasy eyes on approaching vehicles.



2 TO GIVE GREATER SECURITY to street-car passengers when waiting for or alighting from cars, city erects series of safety islands having horizontal steel channel fenders mounted on steel posts anchored in pavement. Workman sets prefabricated "plow nose" in holes cut in asphalt wearing surface and concrete base of pavement.

3 AFTER PLOW NOSE at upstream end of island has been set, erection crew aligns and assembles remainder of structure. Posts supporting steel guard rail are 42 in. high and are set in pavement. Steel grilles 2x4 ft. in area area are laid on steel angles to form deck of safety platform, 6 in. above pavement surface. Each island takes 44 of these grilles.

4 CONCRETE FILL placed around posts anchors them firmly in pavement. Crew of sixteen men erects average of one safety zone per day. Much as safety islands obstruct traffic and mar appearance of street, they seem to be necessary on Woodward Ave.



5 CRASH - PROOF SAFETY PLATFORM removes one hazard from life of rider on Detroit Street Railways. Electric flashing beacon 9 ft. high warns motorist against collision at night. Black and yellow stripes increase visibility of dangerous obstruction by day.

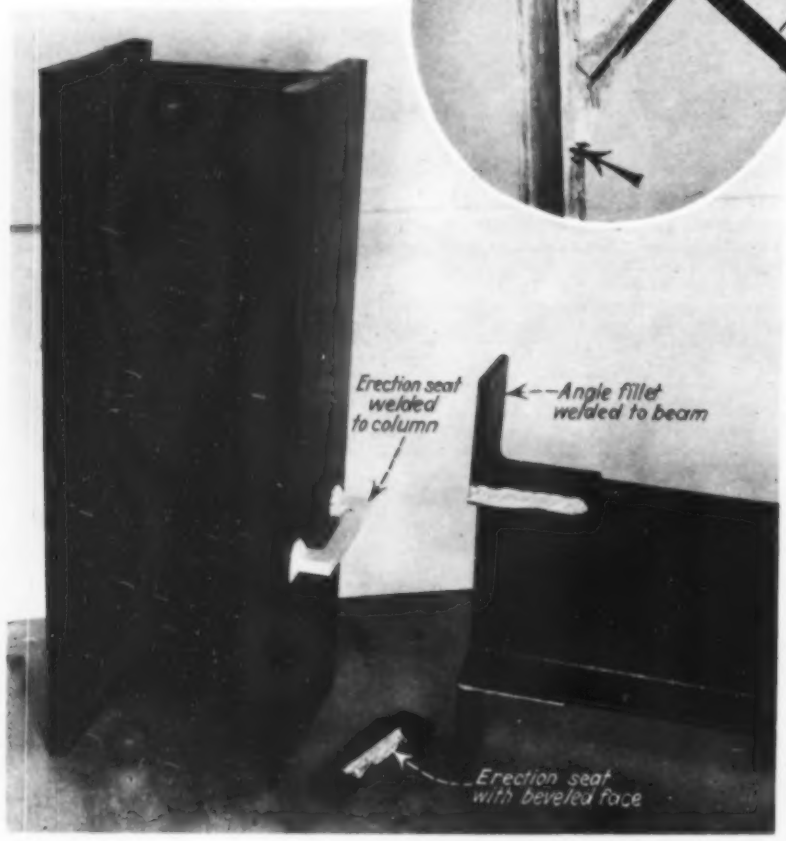
Big Snow Scoop for Little Shovel

TRUCK-MOUNTED EXCAVATOR swinging 1½-yd. dipper cuts way through deep drifts which block plows.

CAPACIOUS SCOOP *(below)* of light steel-plate construction enables small shovel to handle snow in big gobs.

WITH ample reach to cast snow well beyond the banks and sufficient dumping height to clear a 14-ft. drift, a P&H Bantam-Weight excavator mounted on a Ford truck chassis and equipped with a 1½-yd. scoop in place of its ordinary ½-yd. dipper last winter cut a path through deep drifts which stopped rotary and V-type plows on Wisconsin highways and re-opened these roads to traffic after heavy storms. For ordinary road work the truck was fitted at the front with a steel A-frame by which a V-type plow might be attached to the unit. When excavating a drift with the shovel, the truck backed into the snow bank. During the winter just past the bantam excavator gave important emergency service following the heavy snowfalls of January and February.

ERECTION SEATS and angle fillets *(below and in circle, at right)* eliminate bolting in making field connections prior to welding.



Erection Seat Locks Structural Members for Welding

A SPECIAL ERECTION SEAT designed and patented by Van Rensselaer P. Saxe, consulting civil engineer, of Baltimore, dispensed entirely with the use of bolts and rivets in connecting, prior to welding, the structural steel frame of a new building at Maryland's Spring Grove Hospital in the same city. Because bolts and rivets were eliminated, no shop punching or drilling was necessary. In place of bolt holes, erection seats were shop-welded to columns, girders and beams. These seats were engaged by angles or split channels shop-welded to the connecting members.

As much of the steel frame as possible was welded in the shop. Six roof trusses were shop-welded in half sections which later were joined by welding in the field. A plate girder was built up by welding. Rolled sections were used for spandrel beams, columns and roof frame members. The steel frame of the building weighs 100 tons. It is claimed that arc welding saved 7 tons of steel and reduced the time of erection.

In erecting the framework of the hospital addition, the beveled face of the erection seat on one steel member was brought into contact with the angle fillet or channel flange bevel of the second member to which it was to be joined. A rigid connection was made by wedging the angle or channel tightly into the erection seat. Sufficient fillet welds were applied to give the connection its designed strength.

Steel erection and welding for the hospital addition were done by the Acme Steel Engineering Co., of Baltimore, using Lincoln gasoline-engine-driven welders and coated electrodes.

Contractor Drops Bridge Span for Demolition

IN DEMOLISHING the old South Tenth St. bridge across the Monongahela River to make way for Pittsburgh's first cable suspension span, the Vang Construction Co., of Cumberland, Md., and Pittsburgh, contractor for removal of the former bridge and for construction of anchorages and piers of the new, dropped the old main span, 426 ft. long, weighing about 11,000 tons, into the river and completed the demolition with floating derricks. At the south end, the trusses of the old bridge were pin-connected to three-plate shoes resting on bed plates on the masonry pier. The north end of the span was rigidly attached to a steel tower 30 ft. high which was pin-connected to shoes on the pier. This north connection permitted longitudinal movement of the span once it had been severed from its fastenings at the south end. The contractor cut the shoes at the south end in such a way that the weight of the span caused it to move north, clear of the pier, thus throwing the full load on the distorted north tower, crumpling it and dropping the span into the river.

Before dropping the span, the wrecking crew removed the steel floor system, amounting to about 300 tons. Oxyacetylene torches then were used: (1) to sever the middle plate of each shoe at the south end, and (2) to cut an inclined slot through a large part of each outside plate, leaving sufficient plate at the upper and lower ends of the slots to hold the span without danger of shear. The slots sloped from north to south at an angle of about 30 deg. with the horizontal. To the bottom of the slot was bolted a steel Z-plate, as shown in one of the photographs. A steel angle was bolted in similar fashion to the upper side of the slot. The facing flat surfaces of the steel shapes were greased to assure smooth sliding.

In completing the cuts at the shoes, the portion at the lower ends of the slots was burned through first. While the operators were burning away the remaining metal at the upper ends of the slots, the shoes sheared off and slid down the greased plates, dropping the span into the river.

H. G. Quail was superintendent in charge of the work for the Vang Construction Co.

Windowless Building

Provides Healthful Working Conditions

A WINDOWLESS masonry wall building of three stories and basement which recently went into service at Hershey, Pa., provides year-round air conditioning and uniform artificial illumination for the entire office staff and printing plant of the Hershey Chocolate Corp. Completely inclosed except for entrance doorways and effectively insulated against admission of heat, light and sound, the working conditions inside the building are the best that scientific control can produce. The front half of the building, which occupies a plot 151x350 ft., is a steel frame structure with floors of precast gypsum and concrete fill designed for office loads of 50 lb. per square foot. In the rear half the structure consists of a reinforced-concrete frame and flat slab floors with a capacity of 250 lb. per square foot for printing plant and storage use. The presses are placed in the basement.

Self-supporting exterior walls are faced with native limestone and trimmed with Indiana limestone. Luminous glass panels 36 ft. high above the entrances and an illuminated clock in the street facade enliven the appearance of the building at night.

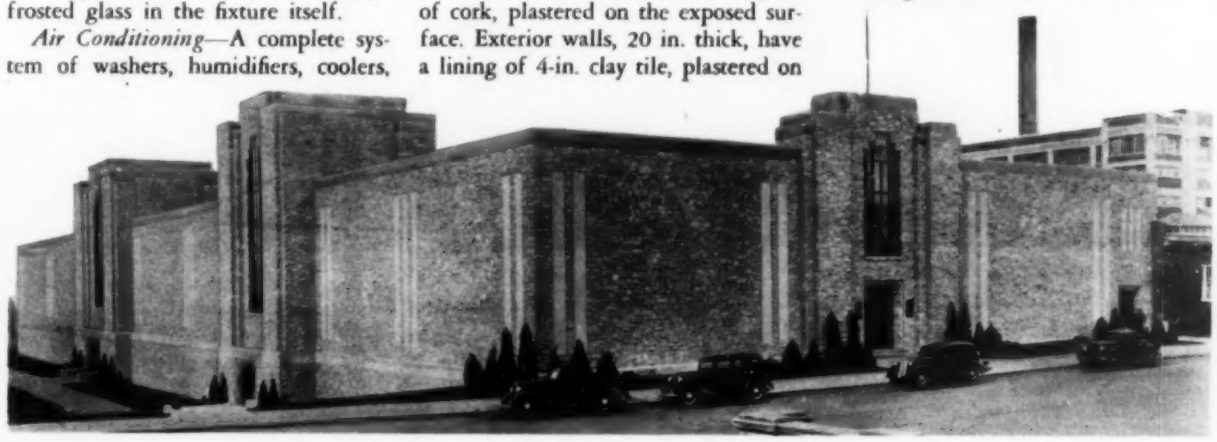
Illumination — Lighting fixtures which combine the blue and violet of mercury-vapor tubes with the yellow and red of mazda lamps produce a blended light which closely approximates the spectrum of daylight and reveals objects in their natural colors. The lighting is designed to provide 20 foot candles at desk level, 95 per cent by reflection from ceiling and walls and 5 per cent by diffusion through frosted glass in the fixture itself.

Air Conditioning—A complete system of washers, humidifiers, coolers, fans, air ducts, grills and supplemental equipment assures a constant supply of conditioned air. The system provides a differential of 10 to 12 deg. between inside and outside temperatures in summer, when the relative humidity will be adjusted to 48 per cent of saturation. In winter the relative humidity is held between 50 and 55 per cent.

Insulation—For efficiency and economy of heating and air conditioning, the walls, ceilings and roof are effectively insulated. On the roof, which is a level concrete deck with an asphalt covering, it is planned to maintain a 2½-in. depth of water to serve to some extent as an insulator. Intakes of roof drains are correspondingly raised to this height above deck level. The under side of the roof is lined with 1½ in. of cork, plastered on the exposed surface. Exterior walls, 20 in. thick, have a lining of 4-in. clay tile, plastered on the inside, with a 1-in. air space between the tile and the stone masonry.

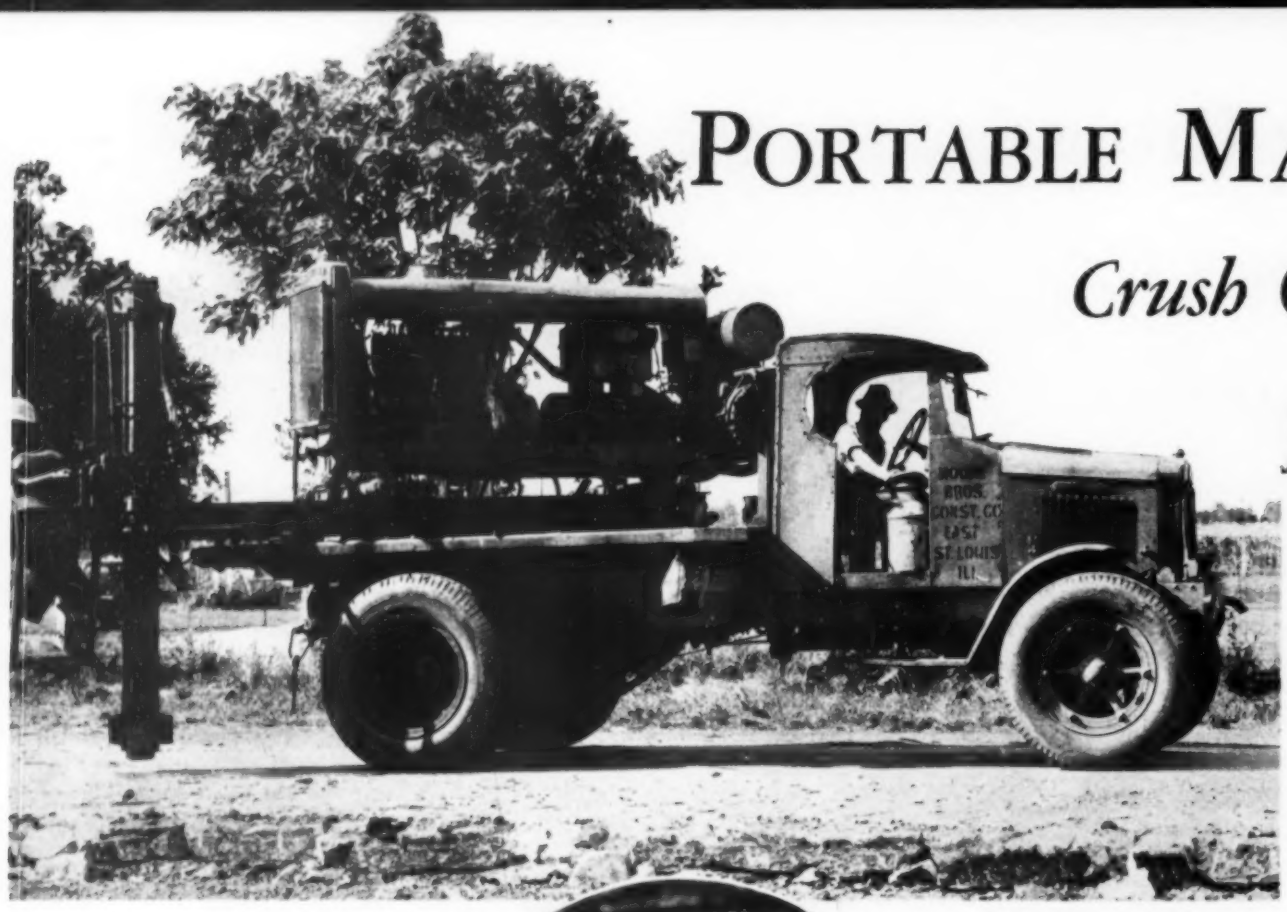
Acoustical Treatment—To dispel the annoyance of interior noises in a windowless building, the designers surfaced a sufficient area in each room with sound absorbing materials to reduce echoes to a comfortable minimum. All ceilings are covered with 1½-in. cork blocks attached to the gypsum slabs forming the structural floor. One large room containing noisy office machines furthermore has walls treated with acoustical plaster.

Designers—Structural and architectural features of the windowless building were designed by D. Paul Witmer, of the Hershey Lumber Co. A. Bowman Snavely, Hershey Chocolate Corp., was in charge of all other work.

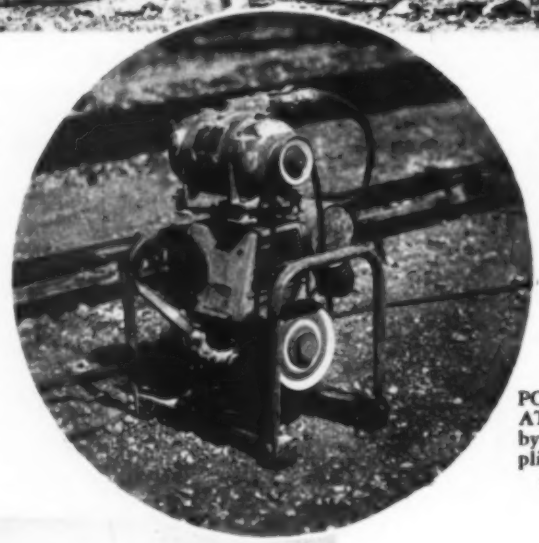


PORTABLE MACHINES

Crush Old Slab for Use in Subgrade of New Pavement



REFUSING to follow the ordinary practice of wasting concrete slab which had to be demolished to make way for new pavement, the Illinois State Division of Highways last season specified that the contractor on a 4-mi. section of new 40-ft. concrete pavement on U.S. 40 near Collinsville, Ill., crush the existing 18-ft. slab to 3-in. maximum size and utilize the crushed material to build up the subgrade for the wider pavement. To carry out this specification the Concord Construction Co., of East St. Louis, Ill., contractor, operated three portable machines designed to break, strip and crush the slab. Foremost of these machines, both in action and in novelty, was a pavement breaker consisting of an air-driven hammer and gasoline - powered compressor mounted on a rotating base at the rear end of a motor truck. Behind this unit, a skimmer scoop fed a traveling jaw crusher which completed the reduction of the concrete blocks to the specified size.



PNEUMATIC CONCRETE BREAKER pivoted on truck body consists of air-driven hammer mounted at rear end of steel-channel frame. Compressor at forward end supplies air to hammer and balances load on frame.

PORTABLE GENERATOR *(left)* driven by gasoline motor supplies ¾-kva. power to concrete vibrator.

INTERNAL VIBRATION adjacent to joints, center-line plates and edge forms is required in Illinois. One man handles electric vibrator.

Apart from the unusual procedure of converting condemned slab into subgrade material, the construction of the pavement itself presented features of more than ordinary interest. A single paving mixer built 20-ft. widths of 10-8-10-in. cross-section at the rate of 1,000 ft. a day. To permit installation of copper-sealed expansion and contraction joints ahead of the mixer, the paver operated outside the forms and distributed concrete across the full 20-ft. width by virtue of a 5-ft. extension of the boom. In advance of the joint setters, a power subgrader traveling on the steel edge forms trimmed the grade to final profile and deposited excess earth outside the forms. As required by Illinois' 1935 specifications, concrete while being placed was vibrated internally along both sides of the joints and along the inside of the forms.

Design of Pavement—Except for a few minor improvements in alignment and grade, the new pavement conforms closely with the location and profile of the old. The new pavement was designed to be constructed in two 20-ft. lanes with a keyed construction joint, but with no dowels, between the two lanes. Each 20-ft. concrete strip has a 10-8-10-in. cross-section with an area of 14 sq.ft. Copper-sealed air-cushion expansion joints with a ¾-in. air space are installed in the pavement at intervals of 90 ft., with intermediate copper-sealed contraction joints 30 ft. apart. Short dowel rods through these joints and through a perforated center-line strip which divides the 20-ft. pavement into two 10-ft. lanes are the only reinforcing bars installed in the slab.

Concrete Breaker — Traffic was detoured around the project during the demolition of the old pavement and the construction of the new. Existing pavement consisted of an original 7-in. slab which had been built up in many places to a total depth of 14 in. by patching with rich mixtures which formed an extremely hard, dense concrete.

To break up the slab, S. R. Blackwell, of the contractor's staff, mounted an air-hammer outfit on the rear end of an International 5-ton truck. Vertical leads for the air hammer were attached to the outboard end of a rotating platform which pivoted about a center pin through the rear end of the truck chassis, as illustrated by

PORTABLE JAW CRUSHER attached to 75-hp. tractor which both draws and drives it reduces chunks of broken slab to 3-in. size for use in subgrade. SPLINED TELESCOPIC SHAFT *(in inset)* with universal coupling at each end transmits power from tractor to crusher.

a photograph. Counterbalancing the weight of the hammer and leads was a compressor mounted on the forward end of the rotating platform. An operator's seat was attached to the outer end of the rotating platform, where the operator could clearly observe the action of the hammer in demolishing the pavement. Hand levers at this position enabled the operator to control both the action of the hammer and the rotation of the platform.

Rotating through an arc at the rear end of the truck, the hammer broke up the existing 18-ft. pavement in half widths of 9 ft. each. At the completion of demolition on each 9-ft. arc, the truck moved forward about 2½ ft. to permit the hammer to continue pavement breaking on the succeeding arc. Air from the compressor was supplied to the hammer at a pressure of 80 to 100 lb. through a four-port valve which controlled the downward and upward movements of the double-acting 260-lb. hammer. The hammer traveled through a 3½-ft. stroke. At the beginning of the job, the pavement breaker was adjusted to deliver 107 blows in 5 min. but this speed later was increased to 175 blows per min. The machine demolished an average of 550 lin.ft. of 18-ft. pavement in a day of 12 hr.

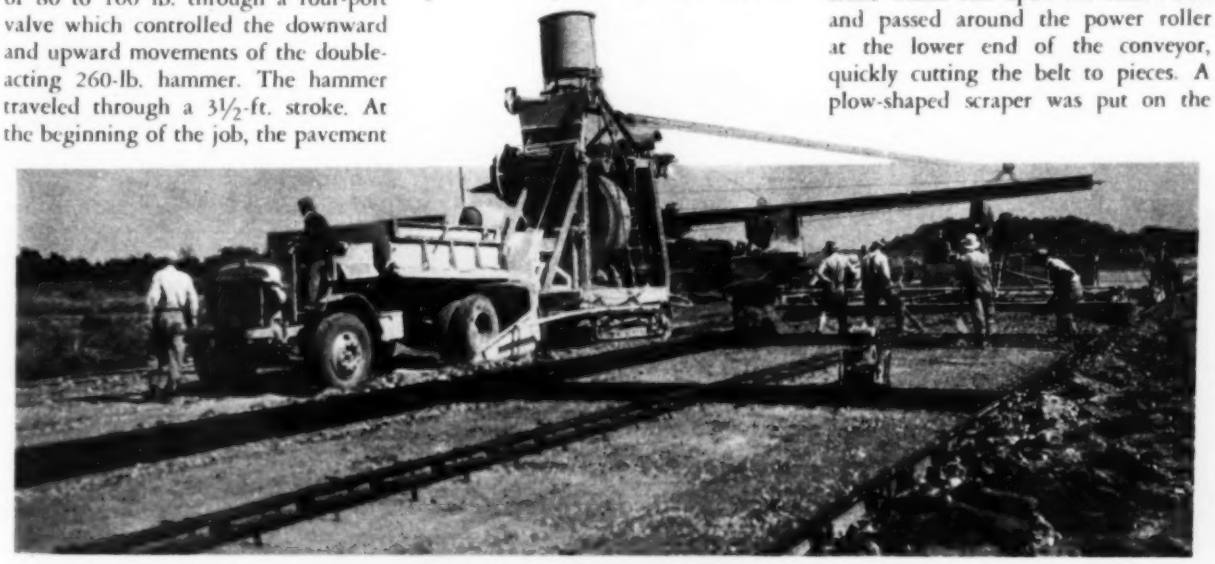
Traveling Crusher — Broken slab was reduced to 3-in. size for incorporation in the subgrade by a Cedar Rapids portable 10x30-in. jaw crusher connected to an Allis-Chalmers 75-hp. tractor. The crusher was driven by multi-V-belt drive from a shaft which was direct-connected through a telescopic splined shaft and universal couplings to a power takeoff on the tractor. To adapt the portable crusher to easy charging by a skimmer scoop, Mr. Blackwell put a large receiving hopper on one side of the machine, supporting the hopper on telescopic pipe brackets which could be adjusted to change the position of the hopper. A Keystone skimmer equipped with a ⅞-yd. slat-bottom bucket stripped the broken slab from the subgrade and placed the chunks of concrete in the hopper. The slats in the bottom of the bucket were spaced 3 in. apart to allow small pieces of concrete and earth to fall back on the subgrade.

CONSTRUCTION SUPERVISORS. (Left to right) C. I. Burggraf, assistant district engineer, and J. K. Langford, resident engineer, Illinois Division of Highways; and A. P. Moore, superintendent, Concord Construction Co.

A belt conveyor at the rear of the crusher deposited the crushed concrete in a windrow behind the machine. At the beginning of the job, the contractor had some difficulty with broken stone which fell upon the return belt and passed around the power roller at the lower end of the conveyor, quickly cutting the belt to pieces. A plow-shaped scraper was put on the return belt near the power roll to sweep off these dropped stones, thus eliminating the trouble. After the work had been in progress for some time, the belt conveyor was lengthened to obtain greater elevation and prevent clogging at the discharge end.

In one day the crushing plant reduced to 3-in. size the broken concrete from 1,022 lin. ft. of 18-ft. slab. The contractor estimates that with a sufficient supply of broken slab available for feeding to the crusher, the traveling plant could easily maintain an average of 1,000 lin.ft. per day of 12 hr.

Fine Grade—On sections of the highway where the center line did not change, the contractor first bladed the shoulder to grade on one side of the existing slab and windrowed the crushed concrete on the portion of the new subgrade thus made ready. After the remaining three-fourths of the new subgrade had been prepared, the windrowed concrete was bladed across the width of the highway and was pressed into the subgrade with a 10-ton roller. A layer of earth was placed on the crushed concrete to fill the voids and true up the subgrade. The initial pro-



20-FT. WIDTH of 40-ft. pavement utilizing crushed concrete in subgrade is laid by mixer traveling outside forms.

cedure was varied as required in places where center-line changes had been made to flatten curves or otherwise improve alignment.

A tumblebug scraper drawn by a light crawler tractor trimmed the high spots and filled depressions between the forms as they were being set. Behind the scraper operated an R. B. power subgrader traveling on the forms and drawn forward by means of two hauling cables anchored to the forms and wound on small winches on the machine. Cutting blades of the machine in contact with the subgrade were adjusted to true fine-grade profile. Earth removed by these blades was delivered to a traveling scraper chain which ran lengthwise through the machine (across the road) and delivered excess spoil to the shoulder outside the form at either edge of the road, depending upon the direction in which the belt was traveling. A 3-ton roller compacted the subgrade behind the power grader.

Pavement Construction — Concrete was produced by a Ransome 27-E paving mixer which traveled on the subgrade or shoulder outside the forms. The mixer was equipped with a special 30-ft. boom to facilitate spreading of concrete across a 20-ft. width of slab. Water both for mixing and for the first day's curing was supplied through a 2½-in. pipe line connected to the Collinsville municipal water system.

Illinois requires a 60-sec. mixing period with all materials in the drum. To allow additional time for charging and discharging, the batchmeter was set at 72 sec. Each batch yielded 28.35 cu.ft. of concrete. An average overrun of 3 per cent reduced the actual pavement yield to 1.96 lin.ft. per batch. In carrying out an average day's paving schedule of 1,000 lin.ft., the paver produced 510 batches in 12 hr., an average of 42.5 batches per hour.

A batching plant for receipt of crushed limestone, sand and sack cement was set up on a railroad siding which crossed the highway about ¾ mi. from the west end of the contract. At this plant a Moore Speedcrane handling a 1-yd. clamshell bucket on a 50-ft. boom filled 65-ton steel overhead bins with sand and crushed rock. Rock was discharged from hopper bottom cars into a track pit from which the clamshell bucket picked it up. Sand was handled directly out of gondola cars. Batch trucks backed under the weight batchers of the aggregate plant to be loaded.

At the next stop on their circuit through the yard, the trucks stopped alongside a box car (or a cement storage shed) to be loaded with sacks of cement dumped from hand trucks. When they were within 1,000 ft. of the mixer, the batch trucks stopped at an elevated platform, built level with the truck bodies, where two workmen opened and dumped the sacks.

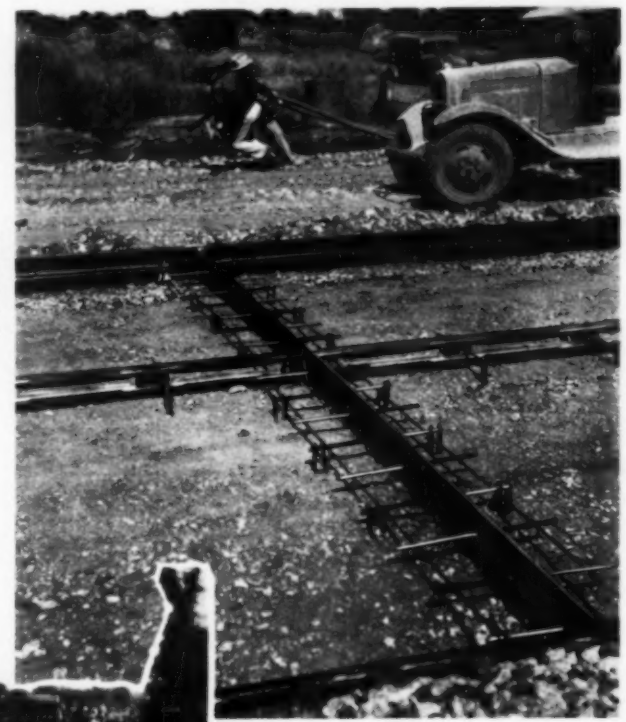
Two-batch and three-batch trucks were used to haul dry materials to the paving mixer. When hauling 3¼ mi. to the east end of the project, the contractor needed an aggregate capacity of 34 batches.

Vibration — Concrete when placed was vibrated internally along the two sides of expansion joints, contraction joints, and center-line strips and, also, in the thickened edges adjacent to the steel road forms. One workman equipped with a Jackson 4-in.-diameter vibro-spade easily took care of all the vibrating requirements. The vibrator consisted of an electric motor housed in a 4-in. cylindrical steel shell at the end of a rigid handle. Vibration was imparted to the concrete by action of the motor which was driven at a speed of about 4,000 r.p.m. by power from a ¾-kva. gasoline-engine generator set weighing only 175 lb. Two men easily picked up and moved this power plant by the handles provided for that purpose.

Finishing and Curing — A Lakewood mechanical finisher screeded the surface of the pavement. Following the finishing machine, two finishers went over the surface with a longitudinal float to remove any waves and then belted the slab before checking the surface with 10-ft. aluminum straightedges. Finally, the surface was broomed and the expansion joints edged. The slab then was covered with burlap which was kept wet for 24 hr. At the end of this time the burlap was removed and calcium chloride was applied to the surface by a hand-pushed spreader at a rate which required a minimum of one 400-lb. barrel for 80 to 90 ft. of 20-ft. slab. The surface was checked for a maximum ⅛-in. variation in 10 ft.

Progress—Pavement breaking started July 31, 1935, and placing of the new concrete pavement was begun Aug. 27. Throughout the entire period of operation, the contractor employed two 6-hr. shifts for each day of a five-day working week. The new pavement was completed Nov. 1.

Personnel—Ernst Lieberman is chief highway engineer of the Division of Highways, Illinois State Department of Public Works and Buildings, and C. M. Hathaway is construction engineer. The contract of the Concord Construction Company was executed under the general direction of S. F. Wilson, district engineer, and C. I. Burggraf, assistant district engineer, East St. Louis, with J. K. Langford, resident engineer, in charge at the site. For the Concord Construction Co., R. J. Moore acted as general manager and A. P. Moore as superintendent.



COPPER-SEALED TRANSVERSE JOINTS *(right)* and doweled longitudinal joint are installed in each 20-ft. width.

POWER SUBGRADER riding on forms and drawn forward by two cables wound on power winches trims fine grade to true profile.

SCRAPER CONVEYOR *(left)* moving transversely across road behind oscillating digging teeth of machine carries spoil to shoulder of road.

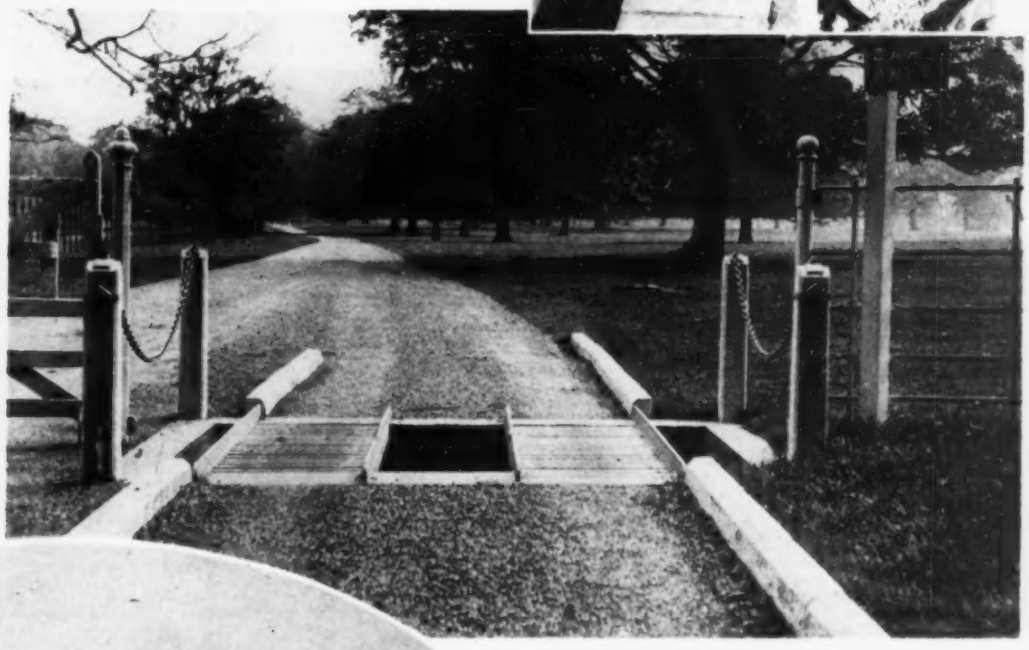
JOB ODDITIES

A Monthly Page of
Unusual Features of Construction

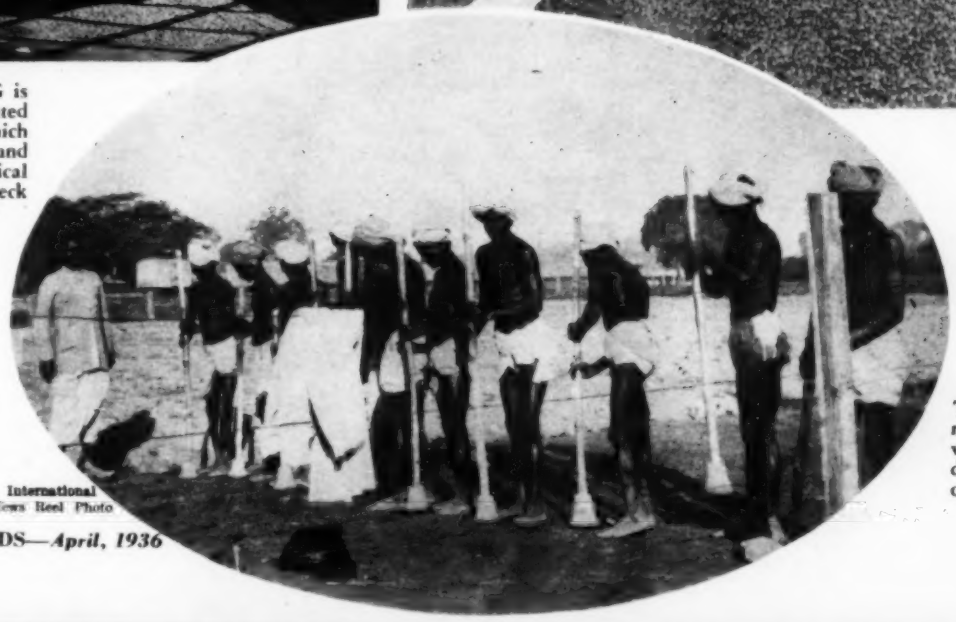
OVER THE HURDLE. High concrete wall along flood channel at Glendale, Calif., proves no obstacle to dipper of 1-yd Bay City power shovel which loads trucks of U. S. Engineers. Skillful operator and accurate control of crowd spot dipper for dumping on opposite side of barrier.

BRICK HEADER CURBS (*at left and below*) instead of integral concrete headers are constructed on Ohio experimental brick paving project (using lean-mix base) by setting bricks against steel road forms about ½ in. into base concrete and filling joints with grout.

MISSISSIPPI METERING is facilitated by truck-mounted power boom and winch which handles flow meter and weight for U. S. Geological Survey from bridge deck above Ol' Man River.



UNBARRED BARRIER deters sheep and cattle from straying through entrance of English estate in Lincolnshire. Concrete-lined pit 4 ft. wide is spanned by two wheel track bridges fitted with round transverse bars at 5-in. spacing, sufficient to keep hoofed animals from attempting to cross.

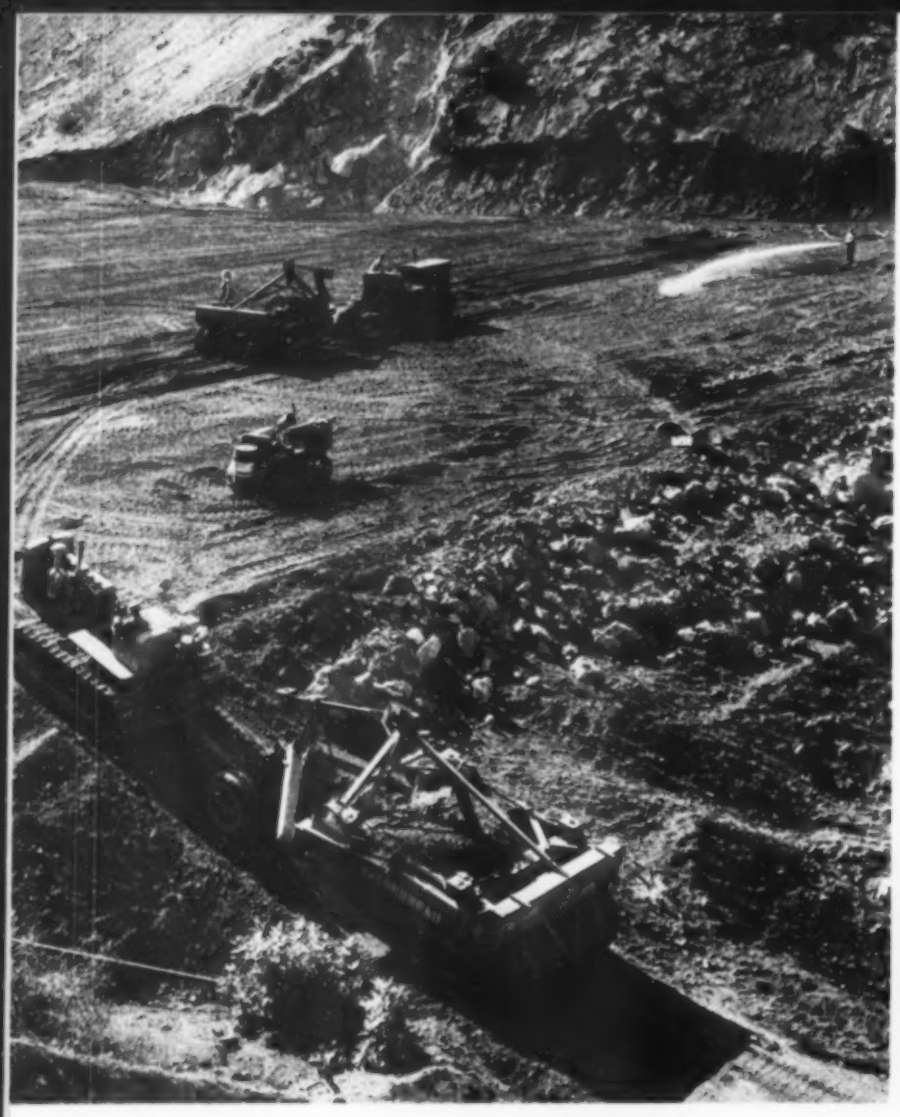


International News Reel Photo

TAMP! TAMP! TAMP! The boys are marching! But progress is pretty slow when a road (*left*) has to be consolidated by this method. One pup roller could outrun several crews of Near Eastern compactors.

Rolled EARTH-FILL DAMS

to Replenish Diminishing Groundwater Storage



TRANSPORTER-TYPE SCRAPERS of 12-cu.yd. capacity carry and spread fill material in Almaden dam. Man at right sprinkles material after it has been spread.

12-YD. LOAD of fill material *(right)* is transported to Calero dam on pneumatic tires.

BATTERY OF SCRAPERS *(below)* picks up and carries earth fill to Stevens Creek dam, where material is compacted after spreading by multiple petrolithic (sheepsfoot) roller unit in background.

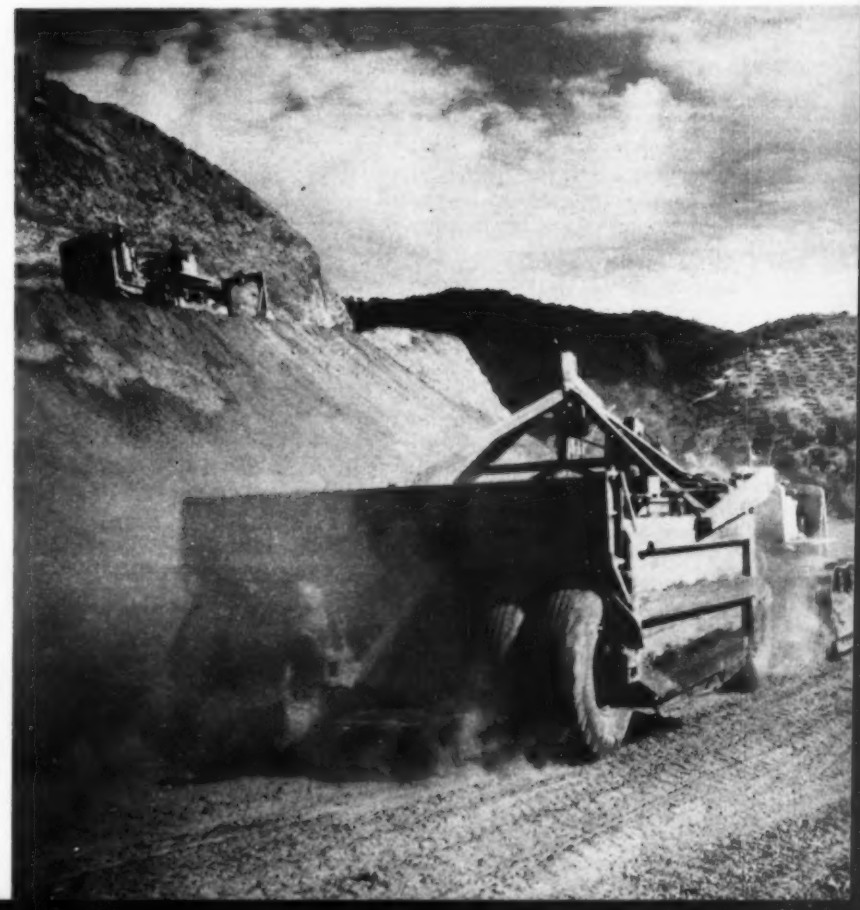
CARRYING out a plan for raising the groundwater level in Santa Clara Valley, Calif., the Santa Clara Valley Water Conservation District is rapidly completing five rolled earth-fill dams for the detention of flood waters during the rainy season and their systematic distribution into natural streambeds thereafter. During the last 20 yr. the water table in the valley has dropped at an average rate of 4.8 ft. per year, and as a consequence water users have been compelled periodically to deepen their wells and provide heavier pumping equipment to assure an adequate, all-year-round supply of water. Pumping costs increased correspondingly. To remedy this situation, work was started late in 1934 on five dams, known as Almaden, Calero, Coyote, Guadalupe and Stevens Creek, all in Santa Clara County.

Fill in these dams totals more than 3,000,000 cu.yd., a considerable percentage of which was taken at the notably low price of 13 c. per cubic yard in place. To get the dams completed between rainy seasons work is done in three 8-hr. shifts. Materials are excavated by power shovels and transported to each damsite by 12-cu.yd. Le Tourneau scrapers. On several

TANDEM PETROLITHIC ROLLERS *(left)* work earth fill at Coyote dam. Water line is suspended from cable running entire length of fill.

PETROLITHIC (SHEEPSFOOT) ROLLERS hooked in tandem behind tractor compact fill in Calero dam, which calls for 604,000 cu.yd. Truck-mounted light plant stands at right. In left background tractor-drawn scraper is trimming face of dam.

EARTH FILL MATERIAL *(below)* enroute from borrow pit to Stevens Creek dam is transported by 12-cu.yd. carryall scrapers.



occasions 25-cu.yd. buggies and standard trucks have been used. Dumped material is spread in layers from 8 to 10 in. thick, sprinkled lightly and then worked over with sheepsfoot rollers operated in tandem, each unit containing 4 rollers. A total of 200,000 cu.yd. of earth and rock is placed each month. At times, under favorable conditions, as much as 1,000 cu.yd. per hour is hauled.

The upstream face of each dam (Coyote excepted) is covered with an 8-in. layer of creek-run gravel on which is placed a reinforced concrete facing 4 in. thick. Shaping and smoothing of the face is done with bulldozers and, in some instances, with scrapers towed by tractors. To facilitate night operations floodlights are installed at strategic points. At Calero portable lighting equipment consisting of a truck carrying floodlights served by a gasoline-powered generator is used. Water for sprinkling the fill material is obtained from a pipe line running the entire length of each dam. The pipe is fitted with hose connections at intervals.

Construction of the Almaden, Calero, and Stevens Creek dams is under contract to McDonald & Bohnett, San Jose, Calif. Teichert & Son, Inc., Sacramento, and Macco Construction Company, Clearwater, Calif., hold contracts for the construction of the Guadalupe and Coyote dams respectively. All work is under the direction of Fred H. Tibbetts, chief engineer of the Santa Clara Water Conservation District.

FIFTH OF A SERIES OF ARTICLES

Planning and Plant for

HEAVY CONSTRUCTION

Principles and Practices of Job Layout and Selection and Use of Equipment for Large Dams and Appurtenant Works

By ADOLPH J. ACKERMAN *and* CHARLES H. LOCHER
Construction Plant Engineer *Construction Consultant*
TENNESSEE VALLEY AUTHORITY, KNOXVILLE, TENN.

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Employment, Material & Financial Schedules
Seasonal Conditions
Equipment Selection

EMPLOYMENT SCHEDULE—A further important schedule, shown in Fig. 1, is the employment schedule. This not only offers an ideal control of costs by comparing actual labor requirements with those estimated but also helps the key foremen to visualize properly their program as it relates to the selection and training of crews, compensation for turnover, making adjustments to fit in with housing facilities and, in general, preventing sharp cutoffs or hurried expansions. This chart may be criticized as appearing unduly uniform, particularly to the oldtime superintendents who were inclined to go out to the gate on Monday morning, pick up a crew for some special jobs and then drop them again the minute the work was finished. Such a procedure, however, is destructive to the morale of the job and in most cases is quite unnecessary.

It is highly desirable to have a certain amount of work going on which requires considerable unskilled labor, so as to serve as a reservoir for special demands and emergencies which arise from time to time. Some of the common operations usually connected with large projects include the relocation, in the reservoir area, of roads, telephone and telegraph lines, power lines, cemeteries, and occasionally the preservation of items of archaeological value. In addition, it is usually necessary to raze abandoned structures and clear large wooded areas, including the cutting and salvaging of usable timber and disposing of waste. All of these operations provide ample opportunity for planning employment to compensate for seasonal fluctuations or reductions in the immediate labor requirement here and there.

Organization chart—Along with the emloyment schedule the preparation of a construction organization chart is really the first step in planning the entire personnel. Such a chart should be clean cut and fully understandable by all men on the job and it is a good feature to set it up on a board where all department heads may study it and gain a thorough understanding of their relationship to the entire organization. Such a chart is shown in the accompanying photograph.

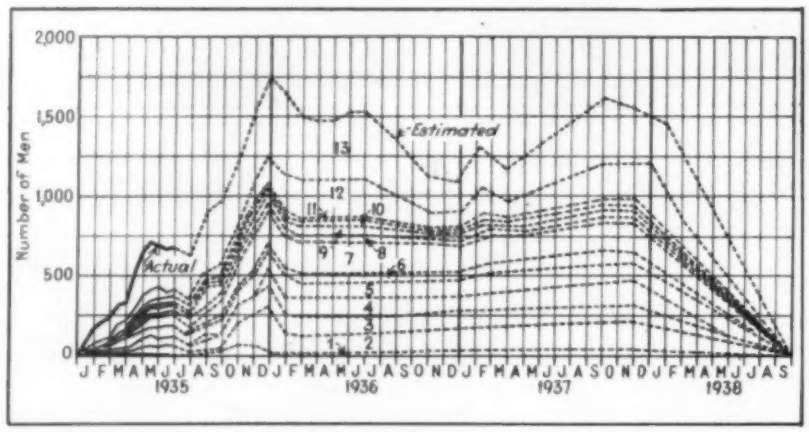
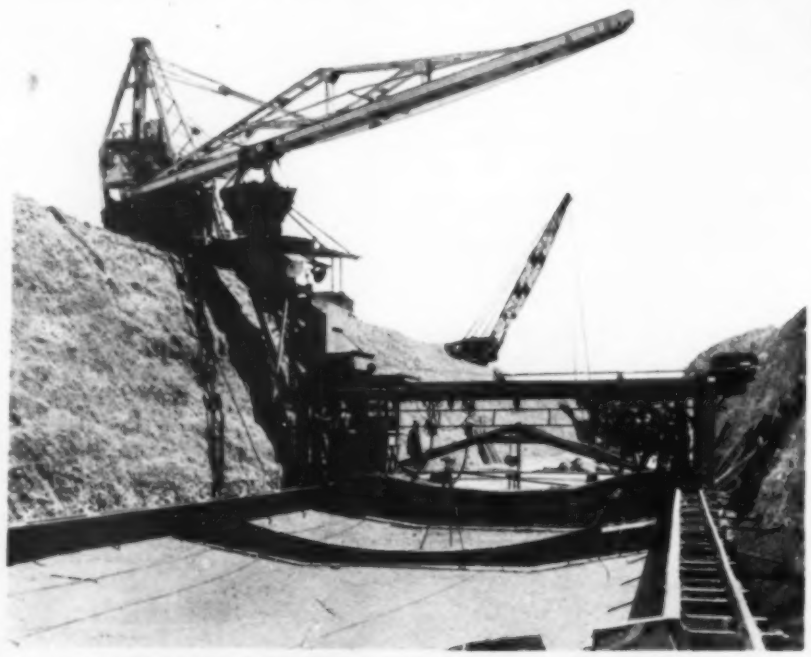


Fig. 1 . . . EMPLOYMENT SCHEDULE shows estimated number of men.

1. Drillers
2. Operators
3. Mechanics
4. Concrete placers
5. Office and engineers
6. Pipe fitters
7. Miscellaneous
8. Electricians
9. Riggers
10. Marine
11. Truck drivers
12. Carpenters
14. Labor

Material Schedule—Tying in closely with the general construction schedule, the agency furnishing the permanent materials such as cement, reinforcing steel, gates, generators, turbines, and the thousand and one other items entering into the project must know very early in the job how and when to make deliveries so as to reduce the cost of handling at the job to a minimum. Adequate storage space on the job is, of course, essential, as it is infinitely better to have the permanent equipment on the job well ahead of requirements to insure against the possibility of cutting down operations until certain embedded parts arrive. On the other hand, market conditions and the general problems of designing, inspecting and manufacturing major items of permanent equipment must be carefully considered.

Frequently such equipment may be of assistance during construction. For example, the installation of flood gates and intake gates of large size can generally not be handled by the available construction equipment, and it is a rather common practice to have the permanent gantry cranes on the job and use them for handling the gates during assembly and subsequent installation in their designated places.



STANDARD EQUIPMENT can often be put to uses for which it was not primarily designed. Here is a dual-drum paving mixer rigged with long boom to deliver concrete to forms for Colorado River aqueduct.

Financial Schedule—Last, but by no means least, it is important to make a schedule of financial requirements to tie in accurately with the construction, equipment, personnel, and materials schedules. Such a schedule is shown in Fig. 2. It is merely an example and not related to any particular project. At the sides are shown six small charts which indicate estimated current expenditures for each classification throughout the period of construction. Of special importance is the chart showing expenditures for machinery, equipment, camp and other items which are very largely at the *beginning* of the job.

The rest of the small charts are self explanatory, except possibly the last one which shows income. A high income is indicated right from the beginning of a job as the result of spreading camp buildings and utilities, construction equipment, financing, and overhead expenses into the operations which will be started as soon as the job gets underway. In the second year the income is high because the job is scheduled to be in its heaviest activity at that time. However, in the final years the

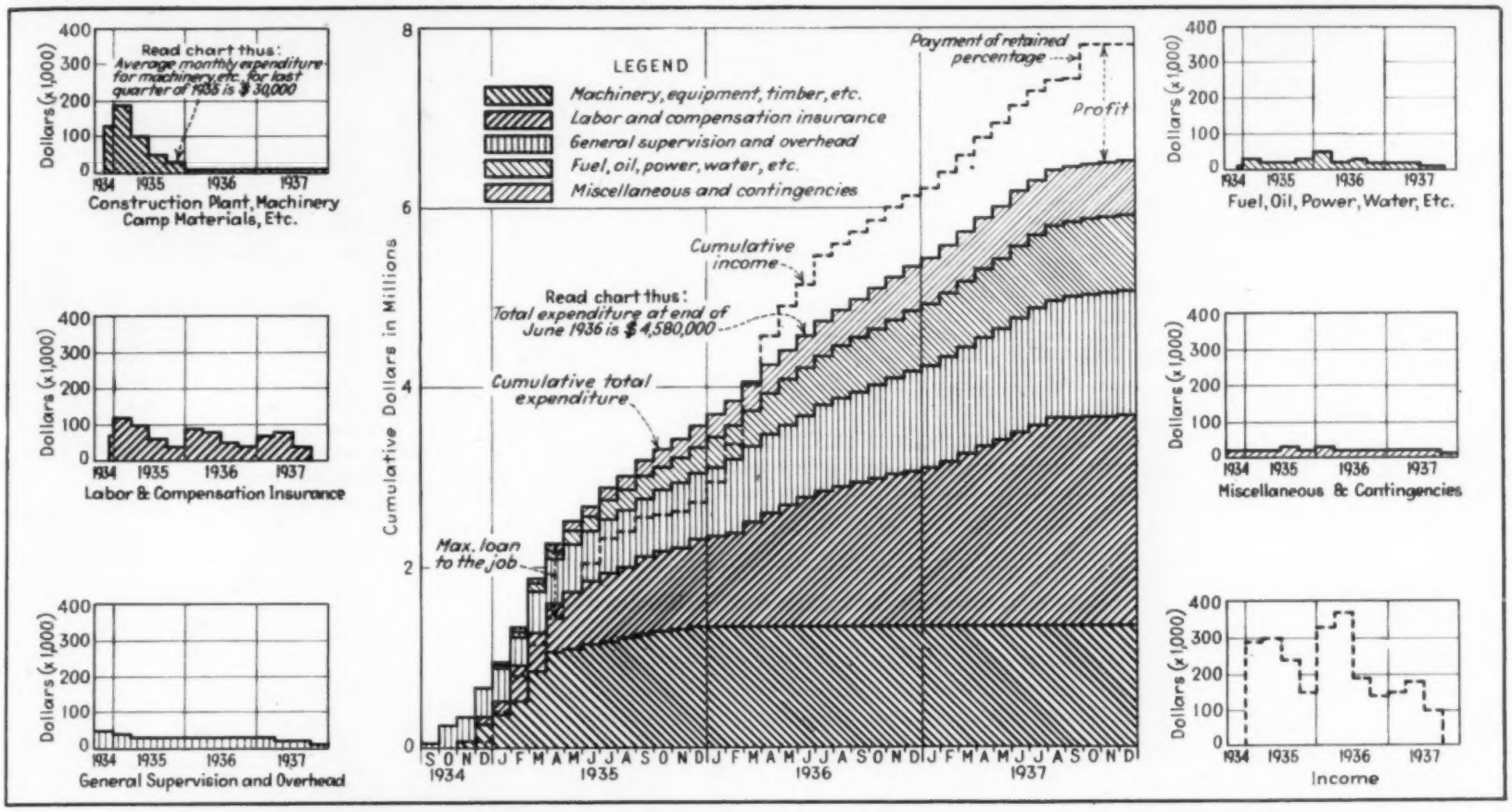
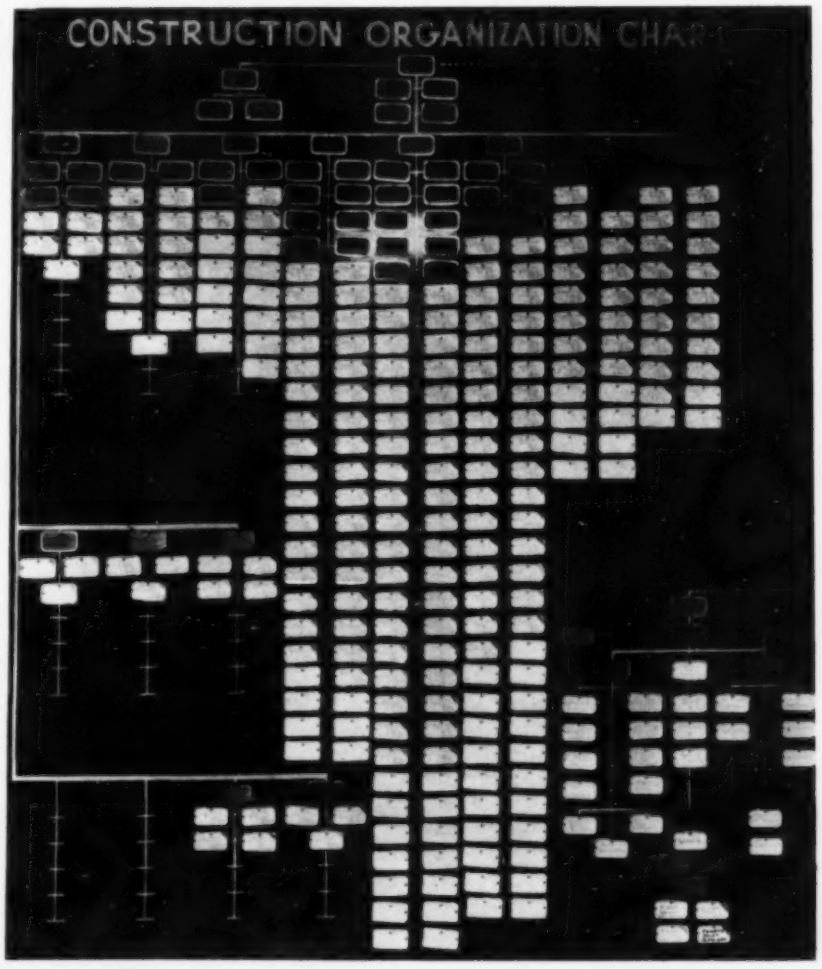


Fig. 2... BUDGET AND FINANCE SCHEDULE for large construction project, based on average quarterly and cumulative income and expenditure plotted on six small charts.

income is quite low, chiefly as a result of spreading most of the major expenses into the first year's operations. This, incidentally, is sometimes referred to as "unbalancing the bid"—with all kinds of implications of abuse. Yet it is important to both the owner and the contractor that the latter shall maintain a sound financial position throughout the job and it is important to distinguish between good financial planning and the abuses of unbalancing bids. Frequently the owner who complains about such abuses may find that they could have been largely overcome if he had set up the bid schedule differently by adding such items as camp buildings, as suggested in Chapter 2, concreting plant, preparatory work, etc. The construction industry, of course, also has a responsibility to eliminate abusive practices.

Referring now to the main budgetary chart, Fig. 2, this is built up by making cumulative additions of each item shown in the small charts. The plant investments are plotted at the bottom of the sheet. Expenditures for labor and insurance are added in the same manner and then plotted on this chart by superimposing them to scale on top of the plant investment graph. In this way, the remaining estimates are all superimposed to develop an overall cumulative expenditure curve. The chart indicates that the total expenditures for the job at the end of the year are estimated at $6,500,000. In the same manner the estimated income has been added cumulatively and plotted on the same chart. The results are especially important from the standpoint of financing because they demonstrate how a job may require as much as a year and a half before total income exceeds total expenditures and shows a profit. The chart further shows how much money must be borrowed to finance the job. This is represented by the maximum amount by which cumulative total expenditures are above cumulative total income.

Control Schedules — Just as the financial charts indicate ideal control of income and expenditures, so it is necessary to control construction operations in the same manner. For this purpose cumulative construction schedules are prepared as, for example, the one in Fig. 3, which shows excavation progress. As long as the actual performance stays close to the scheduled one or runs above it, the management has an ideal indicator that everything is going well. Similar charts prepared for other consistently recurring operations such as concreting, quarrying, hauling, etc., provide a series of control schedules which are indispensable to the management of the job.



CONSTRUCTION ORGANIZATION CHART may be set up on board to acquaint personnel with relationship of departments.

Summary On Schedules—A big railway system runs smoothly from day to day only because it adheres strictly to a well-defined schedule which is closely observed and constantly held in balance by competent dispatchers. In cases of disrupted service, washed out tracks, damaged bridges, or derailments cost is no object in making repairs and restoring all operations to their scheduled channels as rapidly as possible. The same principles apply to a large construction project. The superintendent is essentially a dispatcher who sees to it that his schedules are maintained. His job is to keep the whole picture intact rather than to supervise such a detail as the erection of a derrick. With schedules for equipment, personnel, materials and money properly coordinated there is evidence of sound management and planning, which takes on an immediate importance when it comes to seeking bank loans or other arrangements for financing the job.

Furthermore, throughout the job there is no better way of indicating that it is heading toward success than by keeping all operations along the

estimated trend. Naturally, it must be borne in mind that it is impossible to estimate perfect schedules, particularly several years in advance. However, it is important to plan the "backbones" of the schedules as accurately as possible and to stay with them to the limit. Only in rare cases does it pay to take advantage of special conditions which may for the moment appear very favorable and profitable if utilized. More frequently such attempts to take advantage of the "breaks" may cause a disruption of the entire schedule and more serious losses at some other point in the job.

An interesting incident occurred on a recent job when one of the company officials from headquarters' office came around for a periodic inspection and questioned the superintendent regarding the apparently wasteful methods employed in setting reinforcing steel. The superintendent promptly agreed

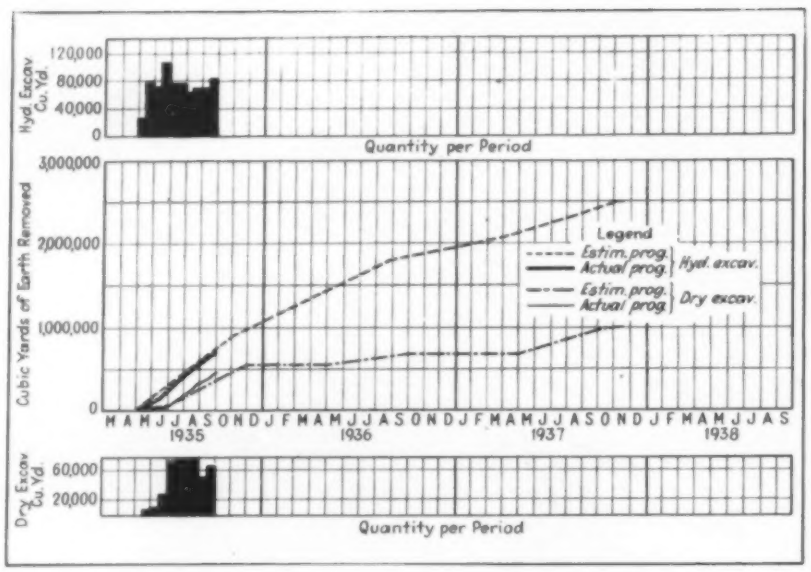
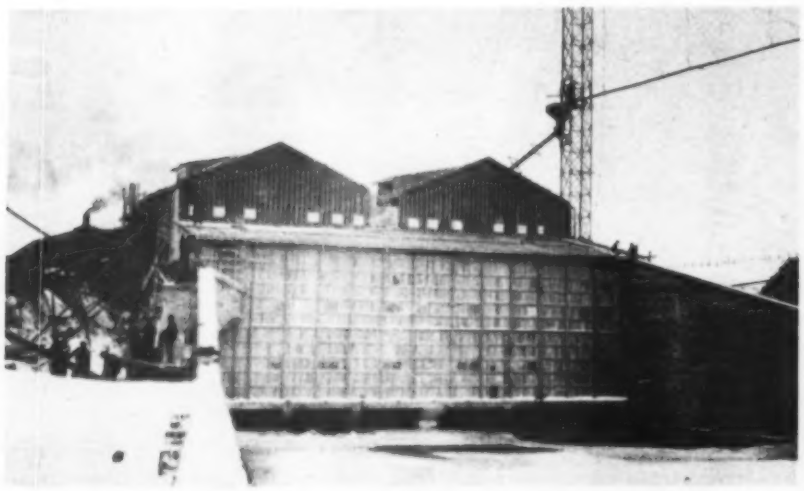


Fig. 3 . . . COMMON EXCAVATION PROGRESS is charted to indicate estimated and actual volume by hydraulic and dry methods.

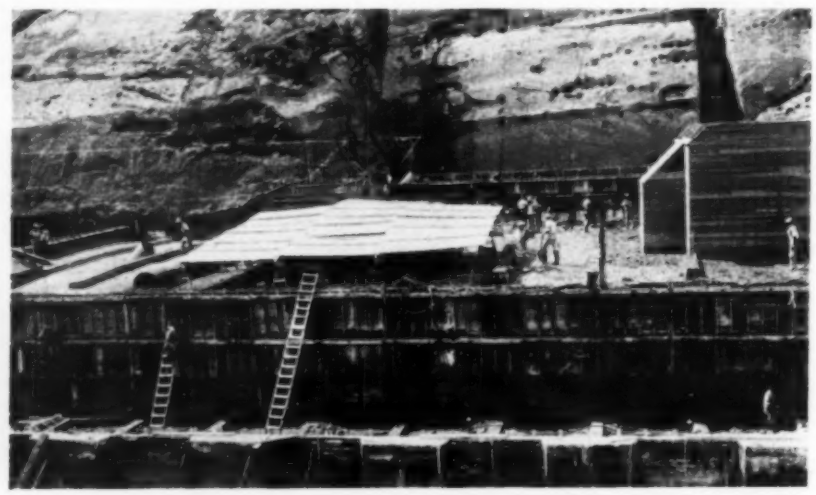
ment of concrete. The photograph shows portable panels made up of wood frames sheeted with canvas which were assembled over the freshly placed concrete to shed the water and permit concreting to proceed, rain or shine.

Summary—The entire profit on the job is generally made at the start through proper planning and by ironing out on paper the major problems, rather than by waiting until it is necessary to make adjustments in the field. Once the general plan, organization, and schedules have been set up, such information can be made to earn big dividends if it is made available to every man on the job. Instead, then, of seeing the loose ends trickle away with the inevitable alibi that, "We couldn't read the superintendent's mind," every one is in a position to help out in the scheme of things by turning "planner."

Selection of Equipment—The fundamental principles of equipment se-



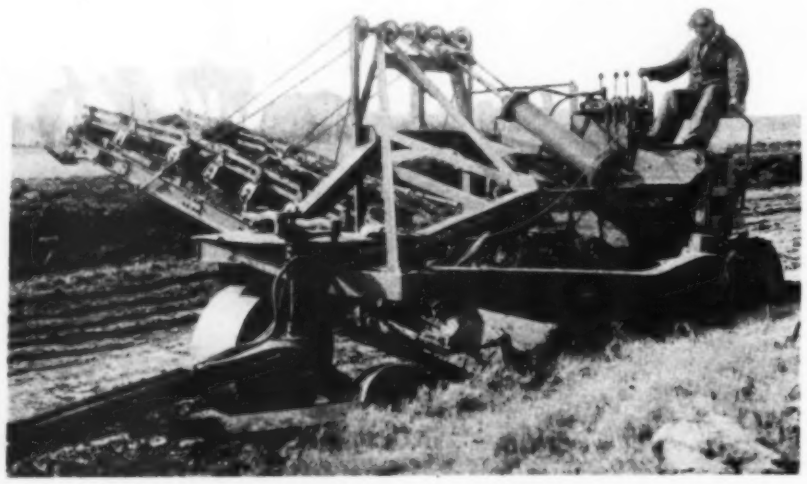
WINTER PROTECTION on power-house construction in northern Michigan is afforded by large wooden structure within which operations continued during freezing weather.



PORTABLE PANELS, made of wood frames sheeted with canvas, are assembled over fresh concrete to shed water during rainy season at Madden dam in Panama.

that he was spending about $300 per day more than it should cost and then proceeded to describe the program for the succeeding three weeks. Gravel was being shipped in from a distance of 50 mi. to meet a definite schedule. Cement, due to arrive 10 days hence, was already being loaded at the mill. The heavy castings which were to be embedded next week were due to arrive within 3 days and special rigging had been set up to handle them directly from cars into their final position. On top of all this the cofferdams were to be removed and the river diverted through portions of the structures then under construction, and the advent of floods was profoundly regular in its occurrence. All these operations, explained the superintendent, if prevented from continuing along their scheduled way, would so disrupt his work later on that it would cost him $1,000 per day for several weeks to regain his lost ground. So he was ultimately saving considerable money by pushing the setting of reinforcing steel to the limit and almost choking the forms with men who were tying up the bars as fast as they came in.

Effect of Seasonal Conditions — When it comes to the question of protecting against seasonal conditions each job has its own particular problem, and it is largely a question of evaluating a shutdown or delayed completion against the cost of protective works and other expenses. One of the illustrations shows a large wooden structure built over the uncompleted section of a power house in northern Michigan, and within this structure work continued throughout the winter on the erection of turbines, switch structures and all of the complicated electric wiring. In contrast to this, another photograph shows construction on the Madden dam in Panama where the tropical rainy season tended to hinder placement of concrete. The photograph shows portable panels made up of wood frames sheeted with canvas which were assembled over the freshly placed concrete to shed the water and permit concreting to proceed, rain or shine.



HYDRAULIC CONTROL has replaced manual control on modern elevating grader. Trend is toward mechanical regulation of all forms of construction machinery.

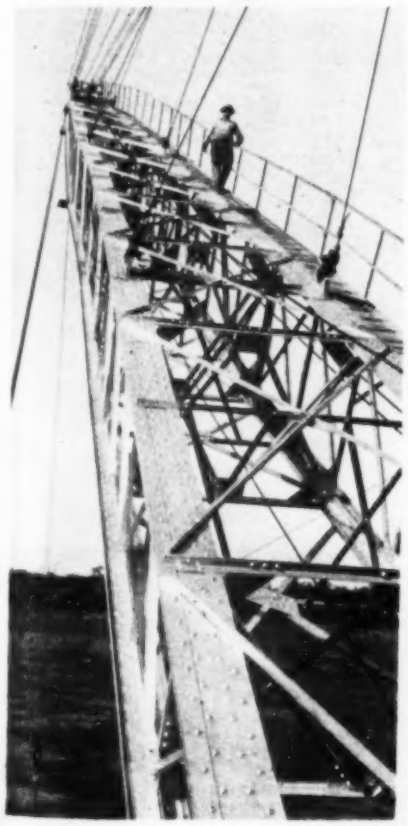
lection are best illustrated by Figure 4, which shows a comparison of operating costs between two tractors after 12 months of operation. The performance at the left is for a heavy-duty tractor with ruggedly designed parts and a correspondingly higher first cost than that of the lighter model at the right. Operating costs were proportional to production and are higher for the first tractor because it turned out more work. The important point is the low item of maintenance and repairs, consequently less outage time and more working time for the first tractor. To the right is shown what happened to the lighter tractor under rough going. Repair costs were unusually high and the output was lower. The important thing to recognize is that these tractors were links in a chain of major operations, and every time one was shut down the entire operation suffered. It is the overall cost of delays and general inconvenience and disruption of schedules through the entire chain of related operations which must be considered in the selection of equipment First cost is generally secondary to reliability. The final result is what counts, as reflected in the unit costs.

Used Equipment—The same general principles also apply to the purchase of used equipment, and first consideration must be given to appraising the useful life remaining in such equipment. Frequently a good investment can be made in the purchase of used equipment for particular operations, but in most cases it is not sufficient to review the history and make a general inspection of the machine. The reliability of the vendor is of equal importance. If the buyer makes proper calculations of operating costs of used versus new and more efficient machinery, he may frequently find that jumping at bargains may be a shortsighted policy.

ADAPTABILITY of standard equipment to special uses is exemplified by this rig. Power shovel dipper has been replaced by bottom-dump bucket for paving concrete highway.

Standard Equipment—The smaller jobs must depend, in almost every case, on the application of standard units and where such units are readily adaptable to a variety of applications, such as a shovel convertible into a dragline or crane, the investment for plant can be held to a nominal figure. However, the very nature of a small job frequently demands more ingenuity in laying out plant requirements than is sometimes displayed on big jobs where there is a tendency automatically to take a large investment in plant for granted. While the equipment manufacturer is constantly seeking to provide the contractor with more universally adaptable machinery, he is also confronted with the necessity of limiting himself to a certain policy of standardization. Among the valuable features which have been developed by manufacturers in the last few years as an aid to increased earning power for the contractor, are the following: Change-over from gasoline engines to the more economically operated diesel engines; introduction of special alloys and metals, such as aluminum booms on draglines (see illustration) for increasing the reach, speed, and capacity of the machine; aluminum buckets; change-over from slow, manually operated levers to easily manipulated hydraulic, air or electric controls on excavating and hoisting machinery. Along with all these improvements has come the all-important development in greater safety features.

IMPROVEMENTS (*below*) in materials extend range of equipment use. Lightweight aluminum alloy makes possible boom 175 ft. long on this dragline.



Special Equipment—The very fact that the manufacturer is in general building a standardized line does not close the door, of course, to his cooperating in the development of special features. However, the buyer presumably is the only one who fully knows the need for such special requirements which may be peculiar to his job and he can frequently increase his earnings considerably by working out special modifications, and either have them installed by the manufacturer or have them designed and made right on the job. This function of plant designing is only one step removed from designing a special plant for a large project. The problem of establishing proper capacities, together with an adequate reserve to take care of special demands, is a major consideration in this series of articles and will be amplified in succeeding chapters. However, special emphasis is again made on the point that even in large special plant layouts, the most successful design is the one which utilizes and adapts, as far as possible, standardized equipment. An example of adaptability is shown in Figure 45 which shows one of the construction kinks which in itself is an advertisement of a well planned job. Here a standard electric shovel was adapted to serve as a cableway for delivering material and equipment from the canyon floor to a higher level.

In all processes of plant selection, full consideration should be given to the availability of spare parts from nearby sales and service depots in addition to having a generous supply of such parts on the job at all times. This feature also brings up the point of standardization of equipment. The economies therefrom are quite obvious when considering investment in spare parts and the all-important factor of simplifying the job for maintenance and repair crews and interchange of operators.

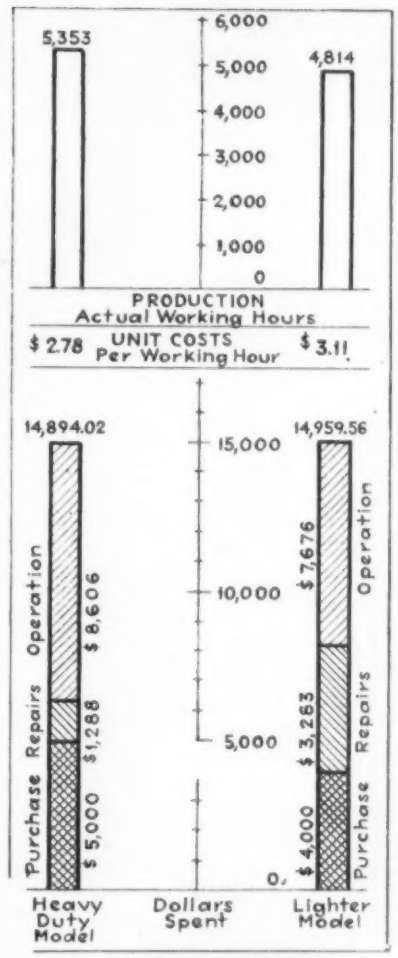
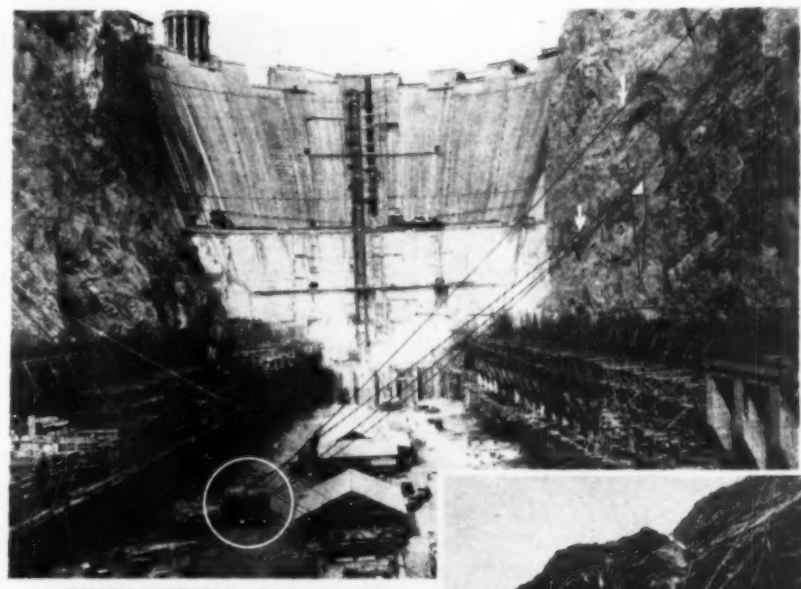
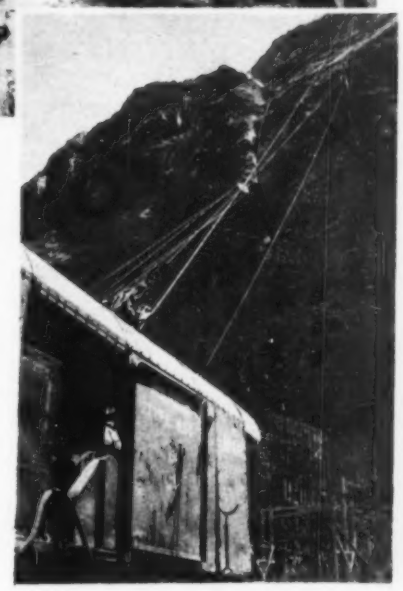


Fig. 4. . . TRACTOR OPERATING COSTS are shown graphically for two machines over period of 12 months. (Heavy duty model, at left; lighter model, at right.)



PINCH-HITTING FOR CABLEWAY (*above and at right*). Standard electric power shovel at Boulder dam is rigged to operate light cableway, another example of ingenuity in adapting regular equipment to special services.



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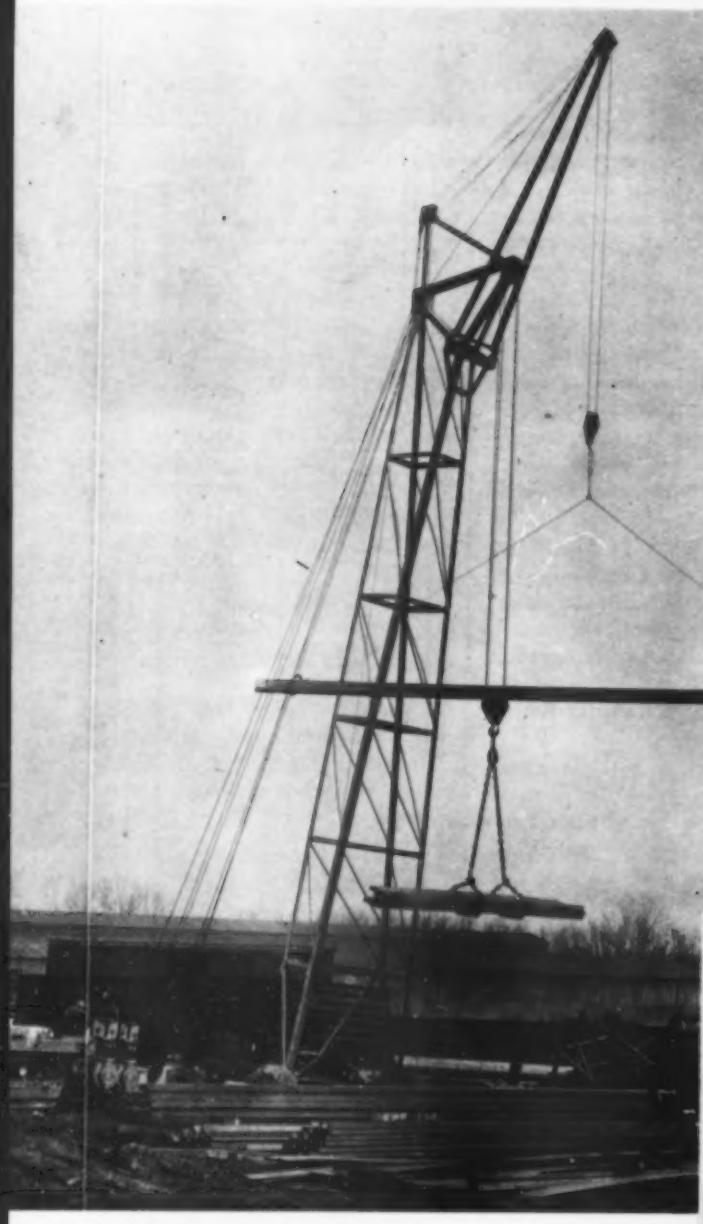
NEXT MONTH—Chapter 6 of the series on "Heavy Construction" by A. J. Ackerman and Charles H. Locher, to appear in the May issue, will deal with "Small Tools, Heavy Equipment Erection and Measuring Equipment Performance."

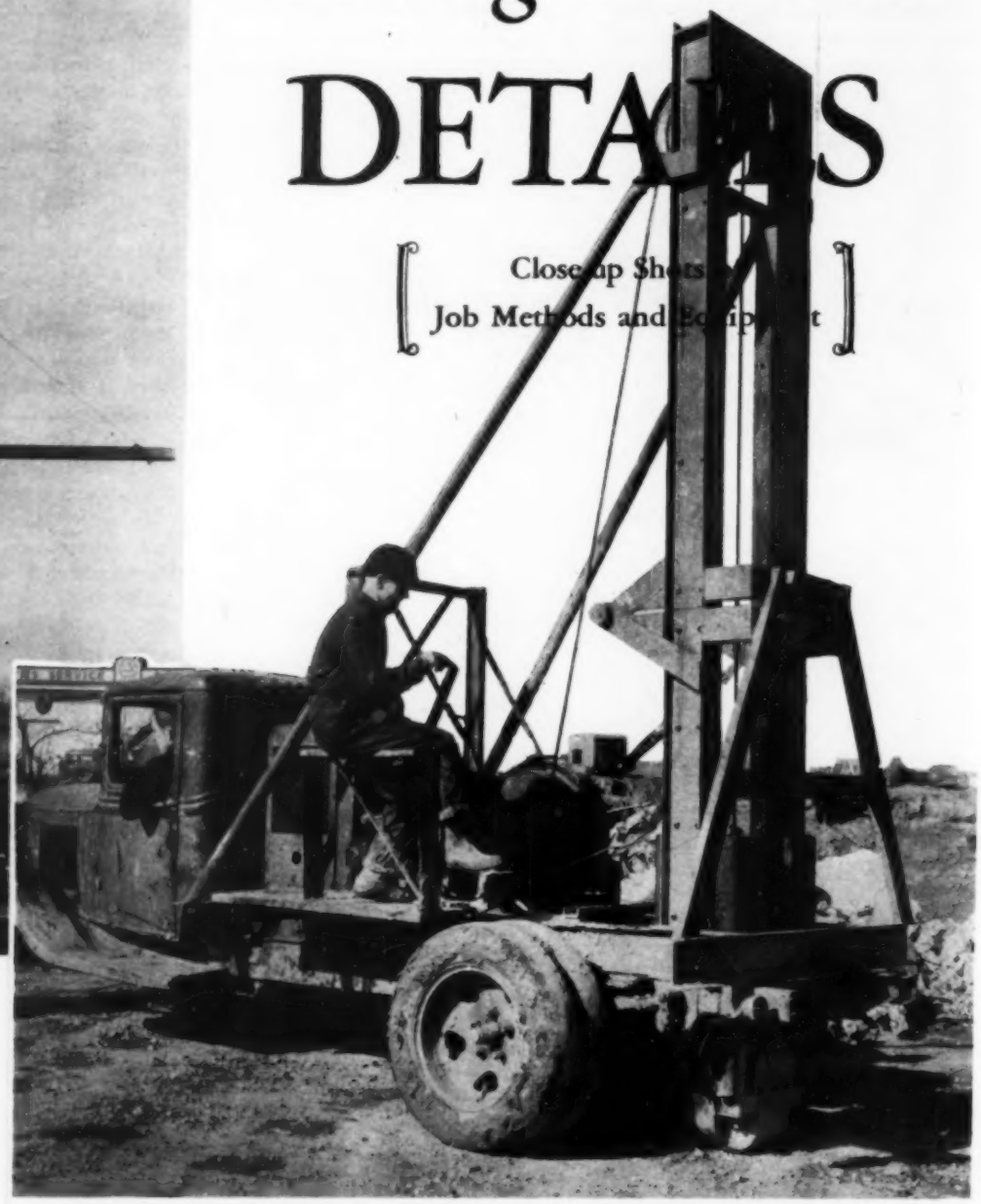
Getting Down to

DETAILS

[Close-up Shots of Job Methods and Equipment]



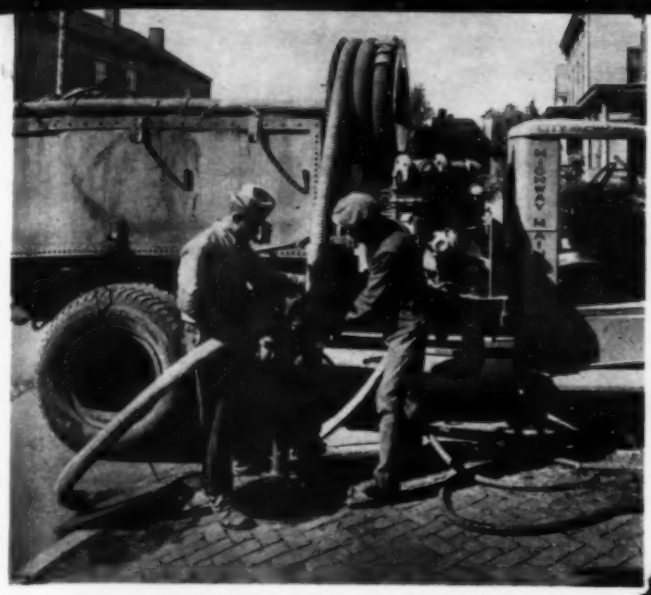
TWO BOOMS IN ONE on 40-ft. two-wheel tractor-crane operated by four-drum power-control hoisting unit on Caterpillar diesel tractor lift two loads simultaneously for Fred Harbers' Sons, building contractors, Peoria, Ill., who some months ago asked R. G. LeTourneau, Inc., to build them tractor-powered derrick of this design and later suggested addition of second load line for lifting materials while original line holds structural pieces in place for erection.



TRUCK-MOUNTED PAVEMENT BREAKER equipped with leads which fold back for traveling demolishes comparatively new 10-in. concrete slab reinforced with ¼-in. and ⅜-in. bars on Dort highway in Flint, Mich., for Finn Equipment Co., of Cincinnati, Ohio, acting under subcontract with Hamer Bros., general contractors. Novo Engine Co. built machine for Finn Equipment Co., utilizing gasoline-powered single-drum hoist to operate drop hammer which may be equipped with various types of breaking noses or with shearing knife for trench work and black-top cutting.

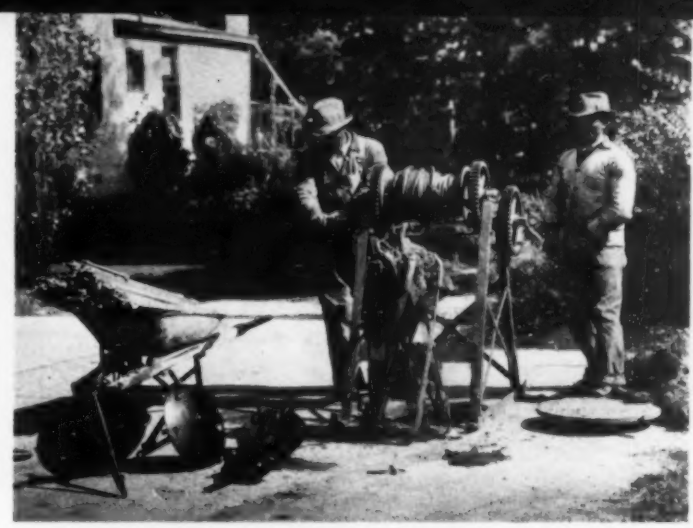
GUY CHAINS anchored to stakes and attached to riveted eyes on hinged wrought-iron collar bolted to hydrant hold hydrant plumb and in alignment while joint is made and ditch is backfilled. *Photo from* WILLIAM *and* J. B. LASALLE, *foremen, Water Department, Washington, D. C., who invented this device.*

LONGEST THROUGH CONCRETE TRUSS SPAN in United States, McMillin Bridge, crossing Puyallup River 15 mi. southeast of Tacoma, Wash., employs novel trusses of such breadth and stiffness that no lateral bracing between them is required. Sidewalks on both sides of roadway pass through vertical and diagonal truss members. Construction simplicity of 170-ft. span aided Dolph Jones, of Tacoma, contractor, in building structure for Pierce County.



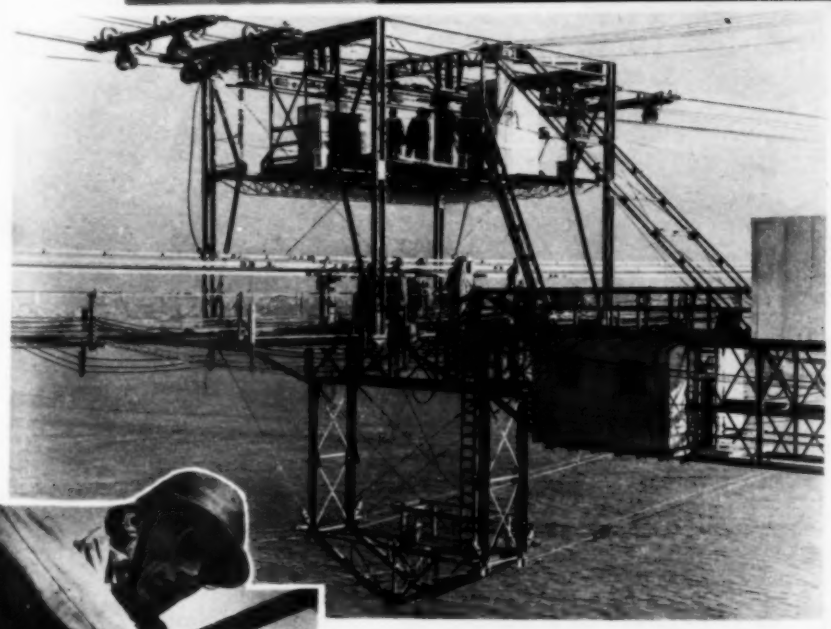
Photos at left and at right are from C. E. BROKAW, *superintendent, highway maintenance, Cincinnati, Ohio.*

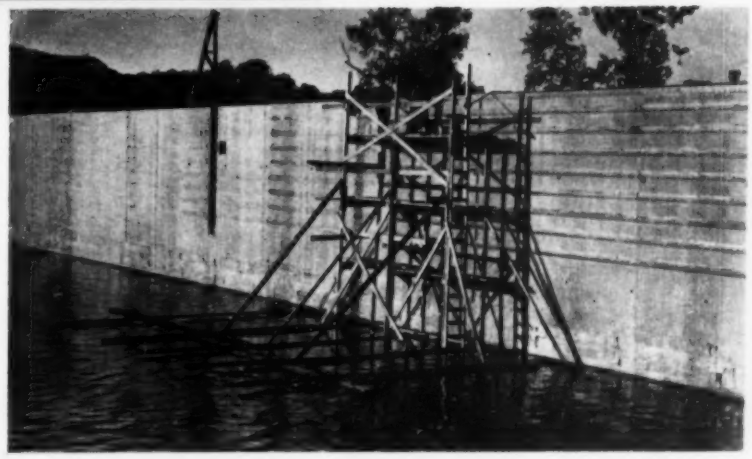
SAFER THREE-LANE PAVEMENT *(below)* on narrow right-of-way is obtained at moderate cost in Pennsylvania by building two outside lanes of portland-cement concrete and center lane of bituminous concrete. Drivers tend to stay on light-colored concrete and use dark center lane only when necessary. *Pennsylvania Department of Highways Photo.*



EXPANDING ROOT CUTTER clears obstructions from sewers in Cincinnati, Ohio. Where roots are abundant, device is contracted to diameter much smaller than sewer and pulled through several times, being expanded on successive trips. Sewer rods (in wheelbarrow) are first pushed through pipe to thread cable used with hand winch to pull cutter. COLLAPSIBLE SCRAPERS (in foreground) are designed to offer little resistance when pulled in one direction and to fit tight within sewer when direction is reversed to remove deposits.

CATCH BASIN CLEANING at Cincinnati, Ohio, is simplified by use of eductor which sucks debris through hose line on reel and thence through flexible connection to horizontal pipe above screened grit chamber on truck. After removal of solids water is returned to sewer through hose held by man at left. Small hose, at right, is connected to return hose for purposes of agitation, if necessary.

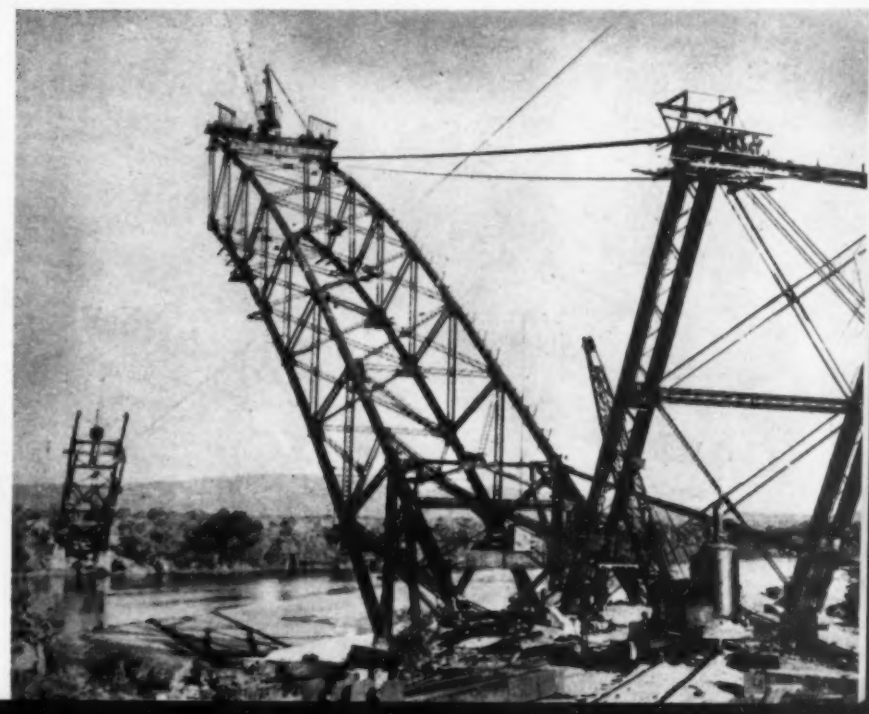




FLOATING SCAFFOLD supports workmen cleaning upper guide wall of Mississippi River Lock No. 6, Trempealeau, Wis., for Spencer, White & Prentis, Inc., New York City, contractor.

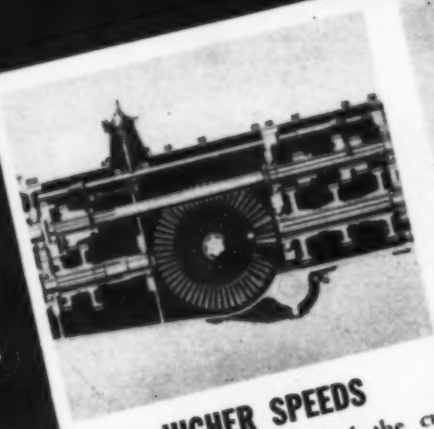
TRANSFER STATION at mid-point of 4,200-ft. Golden Gate suspension span supports platform for cable stringers who exchange loops between spinning wheels traveling to this point from opposite anchorages. After wire loops have been transferred, direction of hauling ropes is reversed, and traveling sheaves start return trips to anchorages. ANTI-GLARE LENSES *(left)* of Calobar super armorplate construction in full-view goggles protect eyes of all workers on Golden Gate bridge from fatigue, flying particles, and inflammation without distorting color values or reducing power of vision.

THIRD LONGEST steel arch span *(right)* in world, Birchenough bridge, 1,080 ft. in length, built entirely of copper alloy steel, is erected across Sabi River in Southern Rhodesia as two cantilevers anchored back to steel grillages at bottom of tunnels sunk 50 ft. into rock, thus avoiding placing foundations in treacherous sand bed of river. Cableway spanning river transports steel out to electric cranes traveling on top chords of arches.



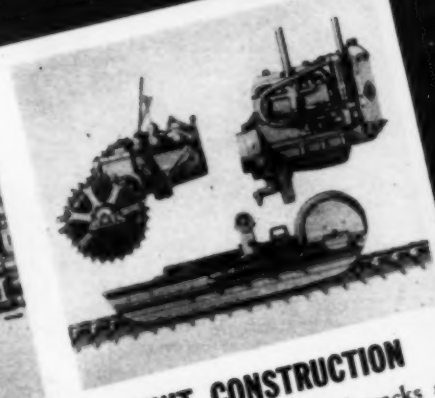
ALLIS-CHALMERS LEA

TYPICAL EXAMPLES OF ALLIS-CHALMERS LEADERSHIP IN TRACTOR DESIGN



HIGHER SPEEDS

Allis-Chalmers established the current trend to lighter weight, higher speed tractors—which do more work per hour, and per dollar invested.



UNIT CONSTRUCTION

Engine, transmission and tracks are rigidly bolted together as units—for greater rigidity, correct alignment, better balance, maximum strength.

INSERTED VALVE SEATS

Exhaust valve seats have hardened steel inserts—more resistant to heat, corrosion and wear. Save grinding; save fuel—exclusive with A-C.

REMOVABLE CYLINDER SLEEVES

Separate, removable sleeves of tough nickel iron. Longer life. Greater cooling efficiency. No expensive reboring—inexpensive to replace.

ROLLER BEARINGS

Instead of plain bearings or bronze bushings for truck rollers, front idlers, etc., Allis-Chalmers uses more efficient, wear-resisting roller bearings.

NICKEL STEEL HARDENED GEARS

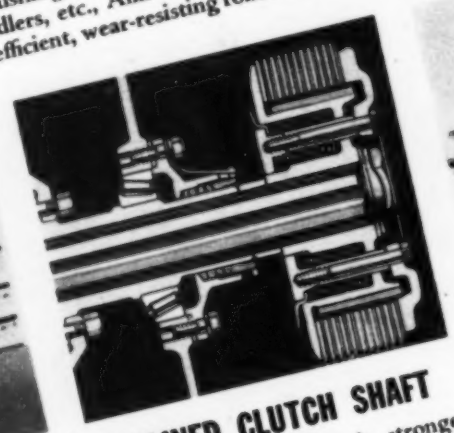
Experience in the selection and treatment of metals for over three-fourths of a century enables Allis-Chalmers to produce the finest gears made.

REINFORCED TRANSMISSION CASE

Exclusive design. Greater strength without excess weight. Easier servicing — makes working parts accessible without removal of adjoining parts.

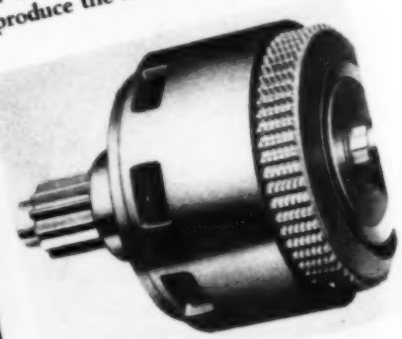
CONTROLLED ALIGNMENT

The crank type stabilizer, exclusive with A-C, keeps tracks in perfect alignment—yet permits extreme flexibility. Saves track wear; absorbs jolts.



SPLINED CLUTCH SHAFT

The A-C splined shaft is stronger and more dependable than the key construction commonly used. Steering clutches easily accessible.

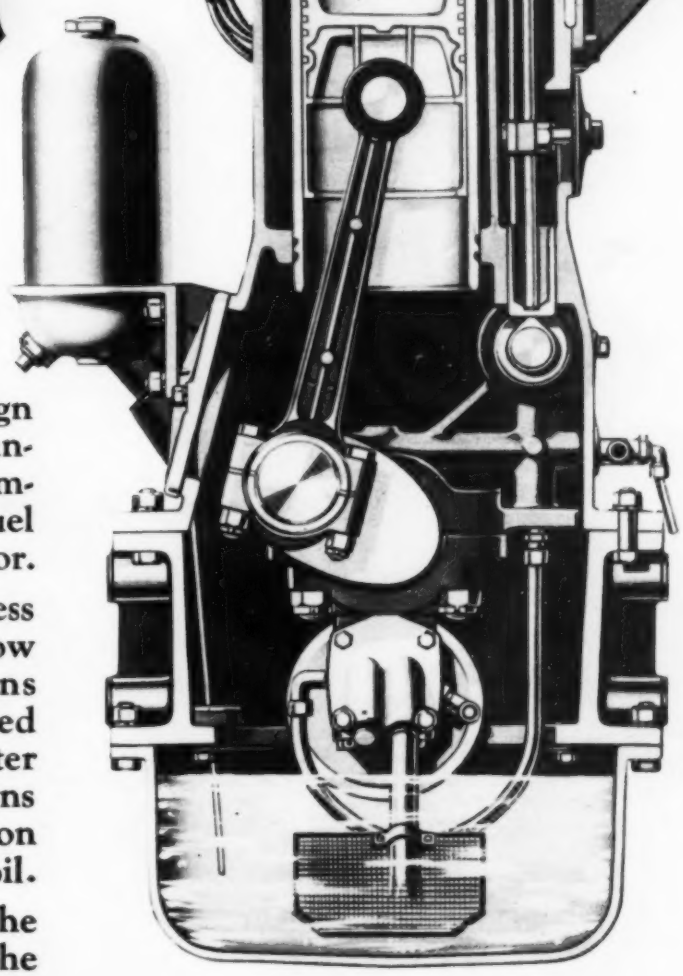


FIBRE TOOTH DISCS

No metal wears on metal in A-C multiple disc steering clutches. Noted for satisfactory service, long life, and minimum replacement.

D NOW..

Controlled IGNITION



NEARLY every recent improvement in tractor design was pioneered by Allis-Chalmers. *Now* comes another outstanding advancement—the first tractor to combine gasoline engine simplicity and smoothness with fuel oil economy—the A-C *Controlled Ignition* Oil Tractor.

Controlled Ignition means smoother operation, less vibration and less maintenance—because of the low compression pressures. Controlled Ignition means instant starting, regardless of weather. Controlled Ignition means simpler design, less dead weight, greater flexibility, better balance. Controlled Ignition means lower first cost and greater value. Controlled Ignition means efficient *Controlled* burning of Diesel fuel oil.

Controlled Ignition is unquestionably the design of the future. But why wait until others have followed the lead of Allis-Chalmers? Enjoy these advantages NOW.

ALLIS-CHALMERS OIL TRACTORS

TRACTOR DIVISION—MILWAUKEE, U. S. A.

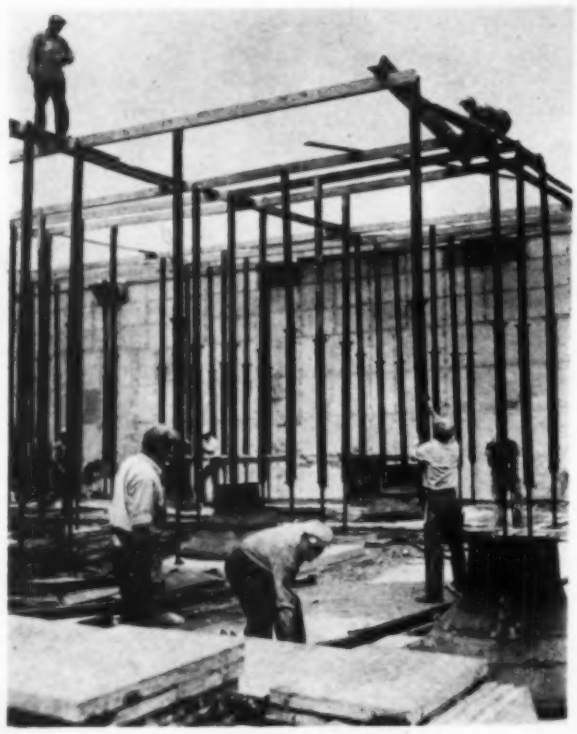
WELL POINTS

Drain Sand Foundation of

Lakefront Filtration Plant

PLYWOOD dresses walls and ceiling of contractor's field office, in which Mr. Proudfoot and Mr. Ashton discuss plans for next day's work.

A COMPLETE CONSTRUCTION PLANT comprising all the equipment elements necessary for a speedy and effective attack upon the difficulties involved in building reinforced-concrete structures in wet sand subsoil adjacent to Lake Michigan enabled the A. C. Proudfoot Construction Co., of Hammond, Ind., contractor, to make rapid progress in constructing a 20-m.g.d. filtration plant for the Hammond Department of Water Works. An extensive well-point system amply supplied with pumps lowered the groundwater level to permit construction of footings and floor slabs on dry sand. Walls and flat-slab roofs of the various plant units were constructed with steel-frame plywood panel forms of a new design which facilitates erection and stripping. A flexible concreting plant produced and placed large volumes of concrete economically.



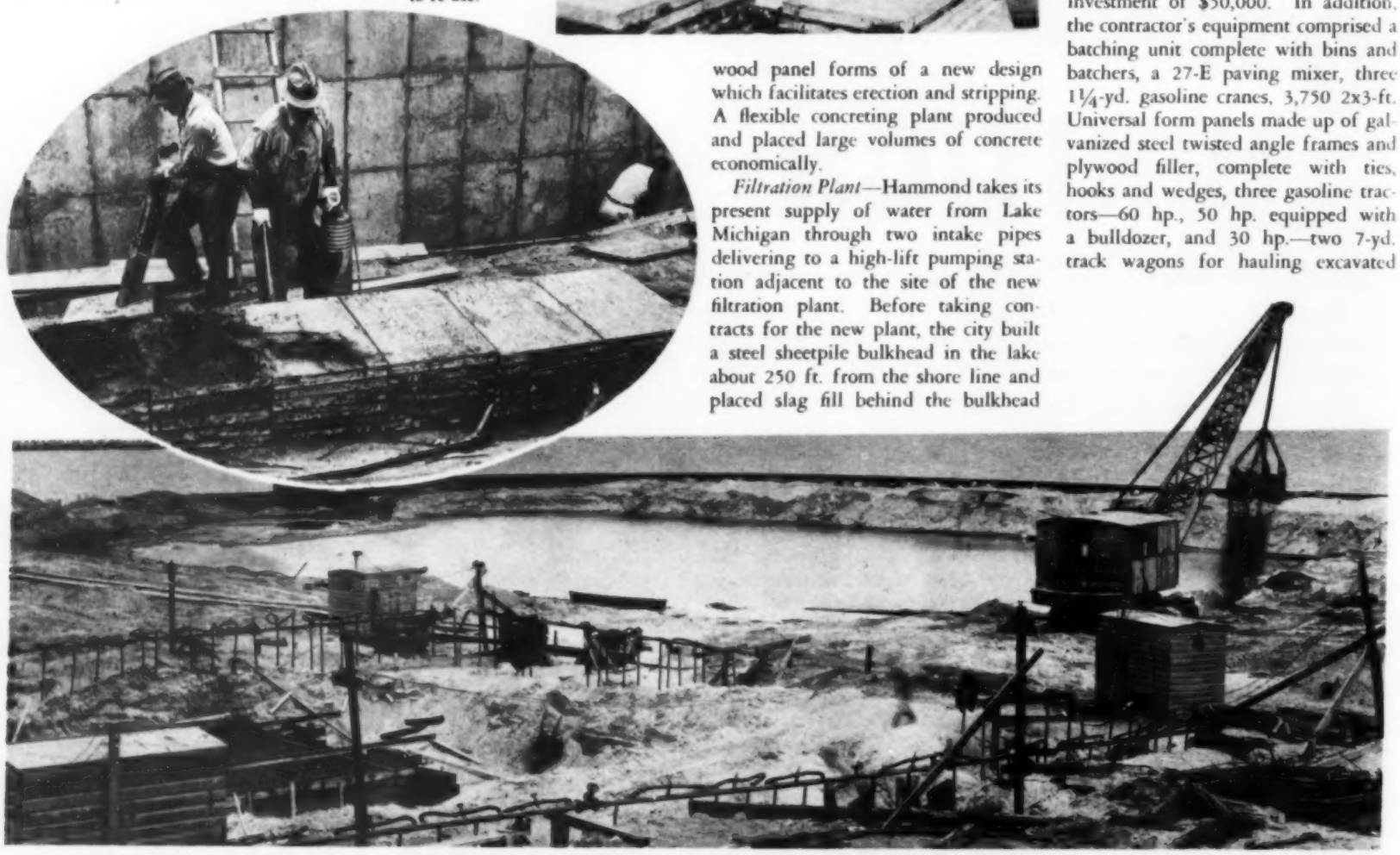
SHORES AND JOISTS *(right)* for flat-slab roof of filtered water reservoir are erected in prefabricated units.

PRESSURE SPRAY *(below)* applies oil to panel forms after stripping and prior to re-use.

Filtration Plant—Hammond takes its present supply of water from Lake Michigan through two intake pipes delivering to a high-lift pumping station adjacent to the site of the new filtration plant. Before taking contracts for the new plant, the city built a steel sheetpile bulkhead in the lake about 250 ft. from the shore line and placed slag fill behind the bulkhead to El. 8 to form the site for the plant.

In the new plant, low-lift pumps will draw water from an existing intake well and will deliver it to sedimentation basins 123x204 ft. in plan and 20 ft. deep. From the sedimentation basin the water will pass to mixing basins for the addition of chemicals and will be delivered thence to rapid sand filters situated above one end of a 5-m.g. filtered water reservoir 230 ft. long by 204 ft. wide and 19 ft. deep. These and other dimensions are indicated on the accompanying plan.

Construction Plant—Equipment and machinery with a replacement value of $125,000 to $150,000 was placed on the job to carry out this contract, awarded at a bid price of about $403,000. The drainage system alone, consisting of 10 Goulds 7x8-in. triplex pumps driven by electric motors and 500 well-points with necessary connections and fittings represented an investment of $50,000. In addition, the contractor's equipment comprised a batching unit complete with bins and batchers, a 27-E paving mixer, three 1¼-yd. gasoline cranes, 3,750 2x3-ft. Universal form panels made up of galvanized steel twisted angle frames and plywood filler, complete with ties, hooks and wedges, three gasoline tractors—60 hp., 50 hp. equipped with a bulldozer, and 30 hp.—two 7-yd. track wagons for hauling excavated



WELL POINTS lower water level for construction of pump room at left before being transferred to periphery of large water hole in background which marks location of filtered-water reservoir. Depression was left for this reservoir in slag fill behind bulkhead.

spoil and two flat-body track wagons for hauling construction materials, and three gasoline-driven portable vibrator units. This array of equipment was capable of carrying on the job effectively and economically against any odds that weather or other natural conditions might impose.

Unwatering Site—Average lake level at the site during construction of the plant was El. 0. although wind blowing to or away from the shore sometimes raised the level to El. 4 or reduced it to El. -2. For construction in the dry of foundations for the pumping station and filtered water basin, the groundwater level, which corresponded almost exactly with the level of the lake, had to be lowered to El. -12. In both cases the contractor lowered the water level with his well-point system.

Foundations for the pump room were constructed first. The footings under the walls of this building, about 114x51 ft. in plan, rest on subgrade at El. -8.25. Under the walls of the filtered water reservoir, the subgrade of the footings ranges from El. -6.58 to El. -7.58, except under a sump at one corner, where the grade of the footing is at El. -10.58. The reservoir is 204x230 ft. in area.

At both sites, the contractor surrounded the area with 3-in. header pipe in 20-ft. lengths, with a 3-in. gate valve at one end of each section. The header pipe was laid at El. 0. Each section of header pipe was equipped with five 1¼-in. valves placed 4 ft. apart; each valve took care of two well-points. A pump was connected into the header for every 100 ft. of line, and the connection was equipped with three 3-in. gate valves to permit full flexibility in utilizing the pumps.

Two well-points were connected to the line at each 1¼-in. valve. Each point consisted of a 30-in. piece of 1¼-in. pipe perforated with ¼-in. round holes and fabricated with a welded steel point for driving. The perforated pipe was covered with a 60-mesh screen which in turn was protected with a brass shield having 1¼-in. holes opposite those in the pipe. Points were connected by means of threaded couplings to 1¼-in. pipe stem about 11 ft. long, giving each point a total effective penetration of 13 or 14 ft.

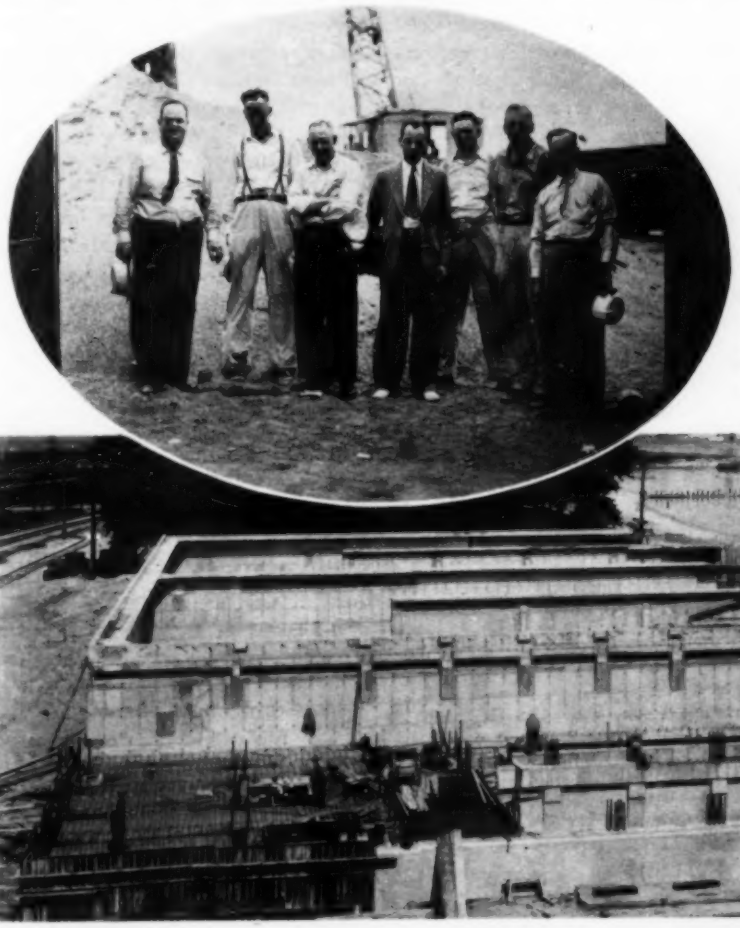
Around the pumping station the contractor used about 460 ft. of line to unwater an area 150x80 ft. For the filtered water reservoir the well-point system inclosed an area about 250x255 ft., requiring 950 ft. of pipe. Deep holes to determine ground water level were left in the concrete floor of the reservoir when the concrete was placed. After this construction had been completed, it was found that the water level could be maintained below the bottom of the foundation by running the pumps only 8 hr. out of each 24.

Concrete Plant—About 12,000 cu.yd. of high-strength, low-slump concrete was required for the job, in addition to a small quantity of filler concrete. A 1-yd. paving mixer charged by batch trucks produced concrete in quantities up to 300 yd. in 12 hr. Mixed batches were discharged into a roller gate bucket which had been built up to 31-cu.ft. capacity to hold the low-slump concrete without spilling. A gasoline crawler crane with a 60-ft. boom handled the buckets into position for placing the concrete directly wherever possible. For points beyond the reach of the boom, the crane delivered the mixture to deck hoppers from which the concrete was distributed by hand carts. The mobility of the mixing and placing equipment enabled the contractor to spot it at any desired point.

Aggregates and cement were delivered by rail to a spur track at the site. A crane with a 45-ft. boom handling a 1-yd. clamshell bucket unloaded sand and gravel from railroad cars to stockpiles and to the overhead bins of a Johnson weight-batching plant. Cement in sacks was loaded out of box cars on to the batch trucks.

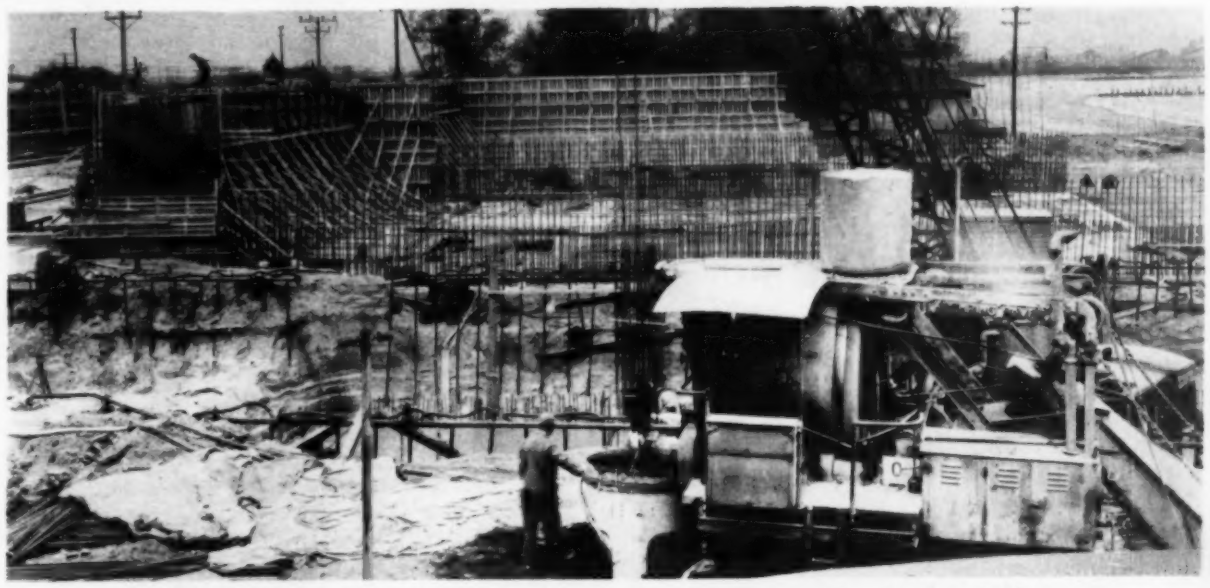
Panel Forms—For the construction of all vertical walls at the filter plant and also for the construction of the roof above the filtered water reservoir, the contractor utilized 3,750 Uni-Form panels supplied by the Universal Form Clamp Co. Each panel was 2 ft. by 3 ft. in size and was composed of a steel frame to which was attached a plywood facing, as indicated by ac-

STEEL-PLATE FORMS for pedestals and capitals of columns in filtered-water reservoir are fabricated on job.



IN CHARGE OF CONSTRUCTION. *(Left to right, in oval)* A. C. Proudfoot, president, and Frank Owens, superintendent, A. C. Proudfoot Construction Co., Ralph Hodnett, PWA resident engineer-inspector; Leo Besozzi, construction engineer, Hammond Department of Water Works; Charles Hill, assistant PWA engineer-inspector; L. G. Williams, resident engineer for Greeley & Hansen; and O. L. Ashton, contractor's general superintendent.

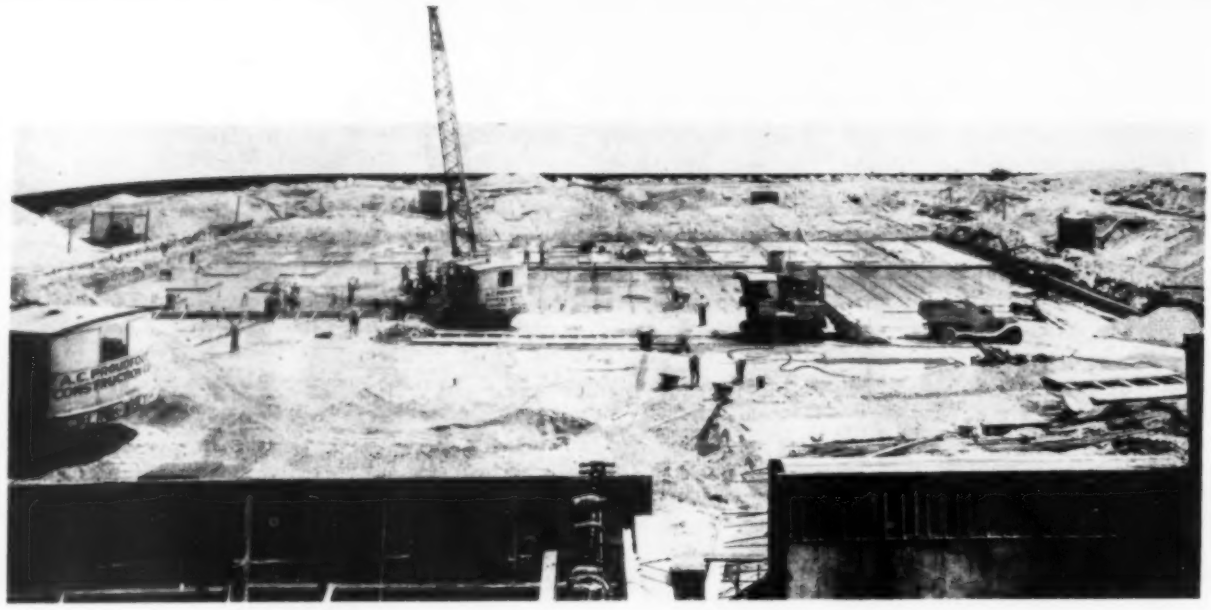
SEDIMENTATION BASINS (in background) and pump room (in foreground) have monolithic walls constructed with plywood panel forms on steel-angle frames.



WALL FORMS of plywood panels on steel angle frames are braced on one side only. Spreader-ties connecting two form faces support other side of wall form. Mobile mixer produces concrete where required.

companying photographs. The edges of the plywood facing were protected by a sheet metal angle held in place by the steel-angle frame and designed to assure snug joints when the panels were assembled in a wall form. Before being placed in the panels, the plywood was given a double dipping in a waterproofing liquid to seal the surface against moisture. The contractor was able to use the panels about 20 times before replacing the plywood. Cement-coated split rivets were used to attach the plywood to the frame, which was made of special carbon steel for toughness.

Form ties were made of ¾-in. by 13-gage band iron and were designed



AFTER WELL-POINT SYSTEM aggregating 950 ft. in length around four sides of filtered water reservoir site has lowered groundwater level, paving mixer and crane traveling on dry subgrade mix and place concrete in reinforced-concrete floor.

INTERNAL VIBRATOR *(left)* driven through flexible shaft by portable gasoline power plant *(below)* consolidates concrete in walls, beams, and roof slabs.

to perform the triple function of locking abutting panels together while at the same time acting both as a spreader and as a tie between the inside and outside forms for a wall. Cut nails driven like wedges through square holes in the outstanding legs of the steel angles locked abutting panels together. As shown in one or more of the photographs, the panels were designed for exact assembly in either horizontal or vertical position, permitting successive courses to be turned as desired to produce the required height of form. The form system was designed to take working loads of 1,000 lb. per square foot, but actually was far stronger.

Erection of Wall Forms—Panel forms for one side of a wall were lined and erected to the full height before any forms were placed for the opposite side of the wall. This method of form erection greatly facilitated the placing of reinforcing steel, which could be set and tied before the second side of the wall was closed. Because the form ties functioned as spreaders, it was necessary to line and brace only the first side erected.

Erection of the first course of form panels started either on a level concrete footing or on a timber sill which could be adjusted in depth to provide any odd inches required in the height of wall. A full course of form panels was placed and was aligned by means of two horizontal timber liners, one at the bottom and the other at the top of the course. The horizontal liners were attached to the panels by means of U-shaped clamps which hooked into holes in the outstanding legs of the steel-angle frames. The clamps were wedged snugly to the liners.

A second course of panels then was erected on the bottom course, a horizontal liner being placed at the top only of this course. Vertical studs extending to the full height of the wall then were set on 6-ft. centers and were attached to the two courses already erected by means of clamps similar to those used for the horizontal liners. These clamps likewise were wedged snugly in place. By bracing the uprights back to U-bolts anchored in the concrete floor, the erectors brought the entire system into line and plumb. Succeeding courses then were erected to the height required.

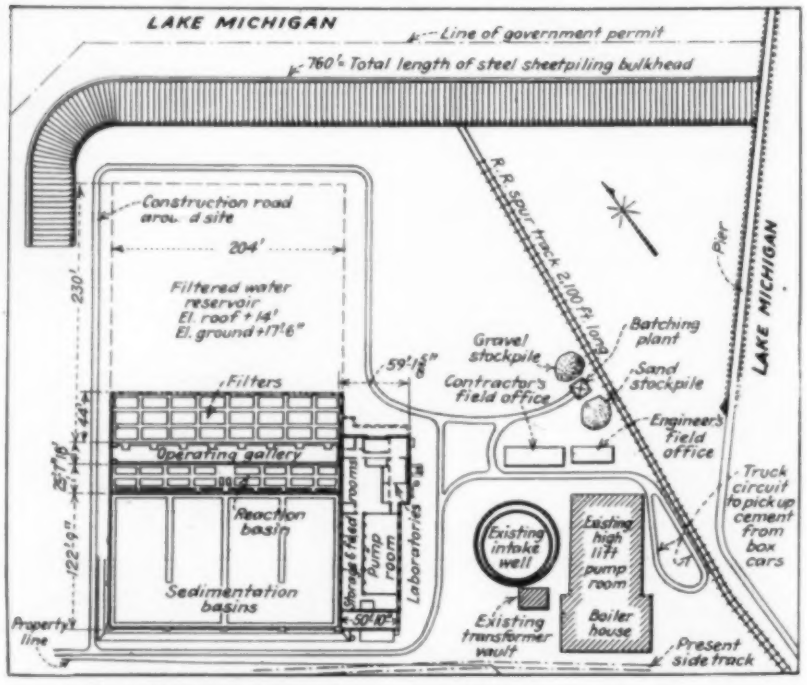
After the steel reinforcement had been placed in the wall, the contractor closed the second side. It is possible with this form system to start placing concrete after the bottom course only has been placed on the second side, but on this project both the engineers and the contractor preferred to erect the entire form system before placing any concrete. In erecting the panel forms for the second side of the wall, the erectors utilized detachable brackets which are supplied as accessories with the form system. The photographs illustrate the application of these brackets to provide walkways at any height.

Stripping Panel Forms—To strip the forms, workmen removed the timber liners and backed out the cut nails. Panels then were released individually by swinging the free side out from the wall.

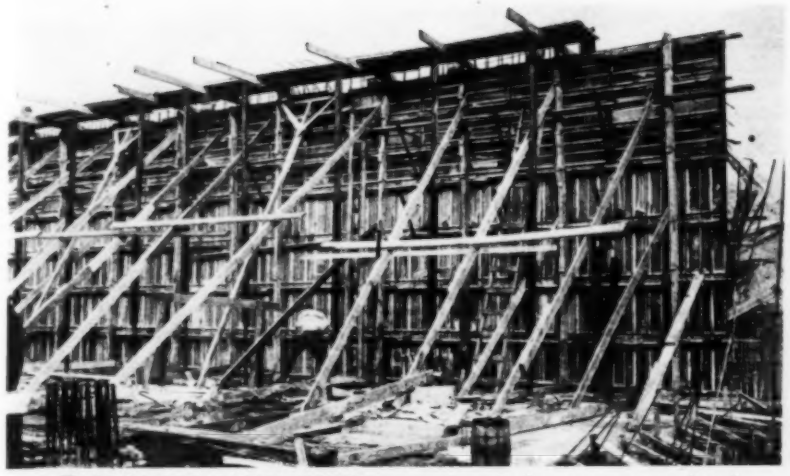
After the forms had been stripped, the ends of the band-iron ties were broken off back of the face of the wall, and the resulting slot was pointed carefully to seal the opening and provide a watertight surface.

Flat-Slab Roof—For the roof of the filtered water reservoir, the contractor used the form panels on 4x6-in. purlins spaced 3 ft. on centers. Steel forms for the circular columns with flared bases and capitals of the filtered water reservoir were furnished and erected by the Kalman Division of the Bethlehem Steel Co.

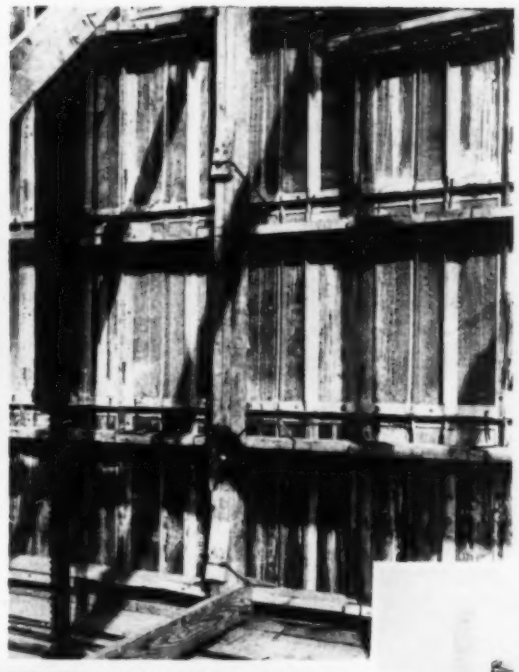
Vibration of Concrete—Specifications required the use of dry mixtures and internal vibration for all structural concrete, amounting to about 12,000 cu.yd. For Class A-1 concrete required in walls, roof slab and beams, the specifications permitted 6 gal. of water to each sack of cement, including the moisture in the aggregate, with a permissible range in slump of 4 to 7 in. This concrete was required to develop a compressive strength of at least 3,000 lb. per square inch in 28 days. Actual tests of the cylinders taken from each pour gave strengths ranging from 3,-



JOB LAYOUT. Construction road encircling site gives access to numerous temporary ramps used by cranes, mixer and batch trucks during progress of work. Sand, gravel, and cement are delivered to job by rail.



1 PLYWOOD PANEL FORMS on steel angle frames are erected and braced to full height for one side of wall before wall reinforcement is placed or second face of wall form is erected.



2 HORIZONTAL WALES *(left)* and vertical studs for first side of wall form are attached by U-shaped hooked clamps to steel angles of form panels. Wedges driven under clamps lock timbers firmly to form.

3 FOLLOWING ERECTION *(below)* of one side of wall forms, steel crew places bar reinforcement unhampered by presence of second side of form. Form erectors set panels for second side of wall close behind steel setters, locking these panels to spreader ties already in place projecting through reinforcing steel.

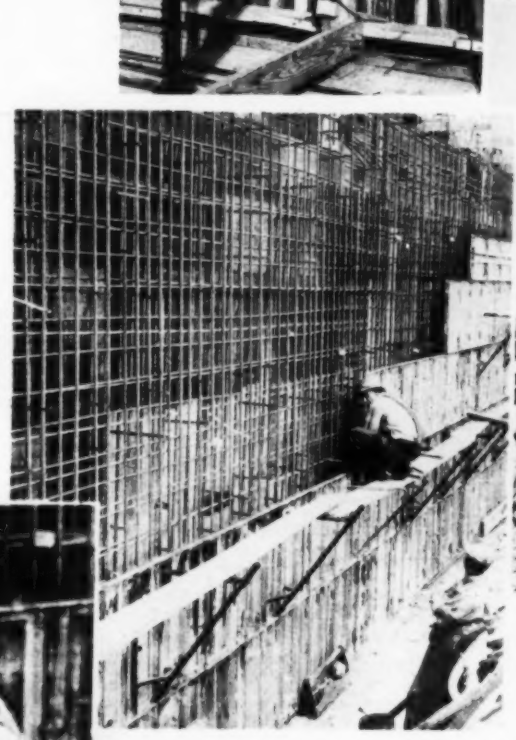
How—

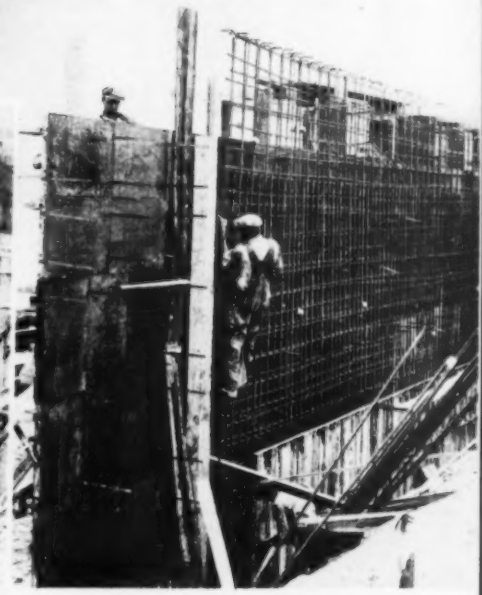
PLYWOOD PANEL FORMS on steel-angle frames are erected for monolithic concrete wall construction.

400 lb. to more than 6,000 lb., with an average of about 4,500 lb. per square inch.

Class A-2 concrete used in slabs placed on subgrade had an allowable moisture content of 6¾ gal. per sack of cement and a permissible range in slump of 4 to 8 in. The strength requirement for A-2 concrete was 2,500 lb. at 28 days. Tests of cylinders at this age indicated strengths of 3,050 to 4,700 lb. per square inch.

4 WALKWAYS *(right)* of planks resting on detachable brackets at any desired height aid workmen in erecting successive courses of panel forms.





5 CUT NAILS *(right)* driven through square openings in abutting legs of steel angles lock adjoining panels together.

6 DETACHABLE BRACKET *(below)* is pinned to vertical legs of abutting panels.

For internal vibration of the structural concrete, the contractor equipped the job with three Mall gasoline-driven flexible-shaft vibrators having vibrator tubes 4 in. in diameter. These machines, which were portable units, turned the eccentric rotors inside the vibrating plugs at speeds of about 3,400 r.p.m. Two of the vibrating units were used continually on concrete. The third unit served as a reserve vibrator and was equipped ordinarily for use in rubbing concrete.

Consolidation of the concrete resulting from vibration caused the yardages of concrete in place to run as much as 5 per cent short of the calculated volume to be expected without vibration.

Concrete Production—A mixing period of 2 min. was required, and the batchmeter on the paver was set for this period and locked. When constructing floor slabs and foundations, the contractor placed as much as 300 cu.yd. in 12 hr.

In constructing reinforced reservoir walls 20 ft. high, ranging in thickness from 1½ ft. at the footing to 1 ft. 1 in. at the narrowest point 3¾ ft. below surface of the roof, the concrete crew completed as much as 425 ft. of wall in two days, utilizing only 10,500 sq. ft. of panel forms. This rate of progress meant that the forms had to be stripped and re-erected once.

Other Items—In addition to the items already mentioned, the contract called for 125 tons of structural steel, 900 tons of reinforcing steel, 500,000 brick to be used as exterior veneer on two sides of the sedimentation basin and on the inside and outside of the headhouse, and a 100,000-gal. steel wash water tank which was erected in the headhouse under subcontract by the Western Gas Construction Co., of Fort Wayne, Ind.

Progress—A contract was awarded to the A. C. Proudfoot Construction Co. in January, 1935. The first concrete was placed May 10, and the major construction items were completed Dec. 1, 1935. It is expected that the entire project will be ready for the final estimates by April 1. Including the bulkhead and fill, the complete improvement represents an investment of about $785,000, financed by PWA loan and grant.

Personnel—For the Department of Water Works of Hammond, Ind., Leo Besozzi is engineer in charge of constructing the new water filtration plant. Greeley & Hansen, of Chicago, consulting engineers, are represented on the project by L. G. Williams, resident engineer. Ralph Hodnett is resident engineer-inspector for PWA.

For the A. C. Proudfoot Construction Co., of Hammond, the contractor, A. C. Proudfoot is president, O. L. Ashton is general superintendent, and Frank Owens is superintendent of construction at the site.

PRIOR TO REPLACING old highway bridge on Dennison Ave., Cleveland, spanning electrified main-line tracks of C. C. C. & St. L. (Big Four) R. R., modern 2,000-ton structure is erected on temporary timber abutments alongside existing bridge. Lack of convenient traffic detours makes it necessary to put new bridge in place of old as quickly as possible. By moving two bridges in unison, Ferro Construction Co., of Chicago, shifts new structure into position formerly occupied by old without any delay to railroad traffic and with only 1½ days' interruption of highway traffic.

Hauling Tackles Move Two Bridges at One Time

SOLID STEEL ROLLERS resting on parallel lines of steel rails carry two bridges in transit from old to new positions. Similar set of rails inverted and bolted together to form a unit serves as bridge seat under end of structures, traveling on steel rollers. Hubs at both ends of rollers are turned down to fit into slots in angle-iron guides, which are perforated to hold rollers in alignment. Under new bridge, rollers are spaced at 7½-in. centers; under old bridge, at 15-in. centers. H. B. Sierts, president of Ferro Construction Co., is standing in light overcoat on sidewalk of old bridge. Beside him is Frank Yost, superintendent.

ERECTION DERRICK CAR simultaneously draws two bridges weighing total of 3,000 tons distance of 71 ft. to new positions. Load line from end of derrick boom furnishes three-part lead to pair of hauling cables, one from each of nine-part tackles attached to ends of structures. Hoist engine in derrick car can exert single-line pull of 7½ tons. Bridge span is 108 ft.

NINE-PART BLOCK-AND-TACKLE *(right)* made fast to steel framing of new bridge close to seat at each end and anchored to deadman draws two bridges simultaneously to new position. Hauling line is reeved through idler sheaves to pulling tackle on derrick boom. Line stretched across tracks forms only obstruction to railroad service during entire operation; time is chosen between train schedules to avoid traffic interference. Old bridge is rolled out on temporary abutment consisting of steel stringers resting on heavy timber bents.

Present and Accounted For —

A Page of Personalities

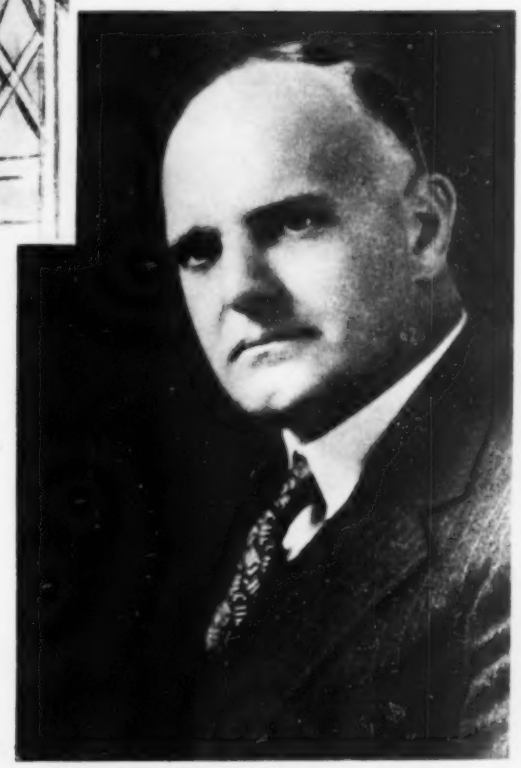
1936 PRESIDENT of Northern California Chapter, Associated General Contractors, is W. A. Bechtel, Jr., of W. A. Bechtel Co., San Francisco, elected at recent meeting of board of directors.

PREMIER BRIDGEMAN *(below)*, Charles Henry Purcell, chief engineer of San Francisco-Oakland Bay bridge, is seen in caricature with his pipe and his prints as he treads temporary footbridges of huge project. Antonio Sotomayor made caricature, which hung in collection on display at Palace Hotel, San Francisco.

CONSULTANTS' LEADER for this year, Edwin F. Wendt, of Washington, entered upon duties as president of American Institute of Consulting Engineers following election at annual meeting in January.

STARTING HIS FIFTEENTH TERM as president of Building Trades Employers Association of New York City, Walter S. Faddis, of Cauldwell-Wingate Co., New York, has just resumed active direction of association's affairs following two months' sojourn in California.

MISSOURI CONSTRUCTOR *(below)*, C. A. Neyer, of Billings, Mo., former treasurer of Associated General Contractors of Missouri, now heads association as president as result of election at annual meeting in Kansas City, Feb. 1.

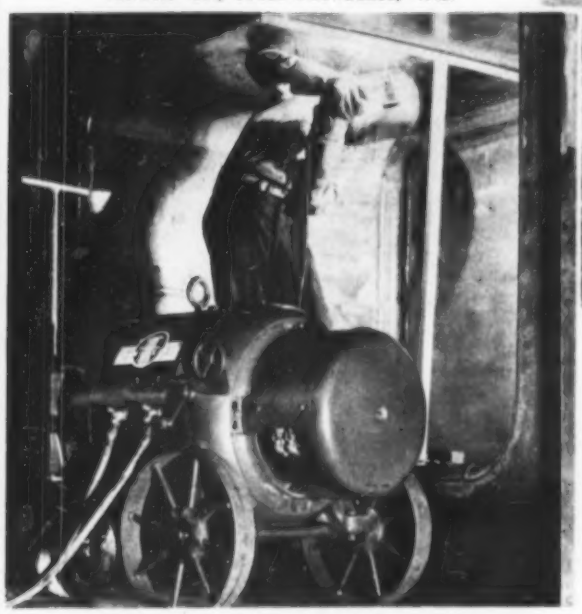


CHIEF STATISTICIAN of Census of Construction, U. S. Bureau of Census, F. A. Gosnell directs work of 3,000 persons who tabulate and coordinate reports in Philadelphia office opened especially for this purpose. Business statistics of great value to construction are expected to result.

NEW EQUIPMENT ON THE JOB

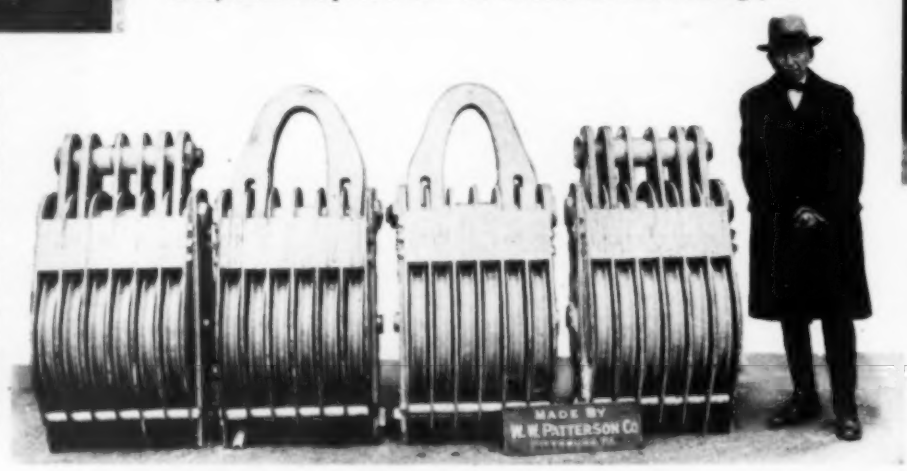
30-YD. DIPPER on new giant power shovel lifts 45 tons of earth and rock at each pass on coal stripping operations near Terre Haute, Ind., for Binkley Coal Co. of Indiana. Mammoth machine has 105-ft. boom, 64-ft. dipper stick, maximum dumping height of 70 ft., cutting radius of 115 ft. and dumping radius of 106 ft. Control cab located at height of 3-story building where operator manipulates 32 different controls for motors used in various operations of moving, leveling, digging and dumping. Huge dipper capacity, combined with tremendous dumping range and high speed digging cycle, makes possible economical open-pit mining of ore and coal previously beyond profitable recovery.—Bucyrus-Erie Co., South Milwaukee, Wis.

7-YD. HEAP-CAPACITY WAGON (*below*) tractor-type unit for use in earth-hauling field has travel speed of 20 m.p.h. Features: "Automatic hand" which dumps load instantly and, at operator's will, automatically closes door as soon as wagon pulls away from load; "non-raring" hitch; turning radius, greater than 90 deg.; monoplate welded body construction; free swinging doors, instantaneously opened at all speeds without retarding mechanism; high arched rear axle for maximum dumping clearance. Ample power and lug-type tractor tires give positive traction for quick movement. —Koehring Co., 3026 W. Concordia Ave., Milwaukee, Wis.



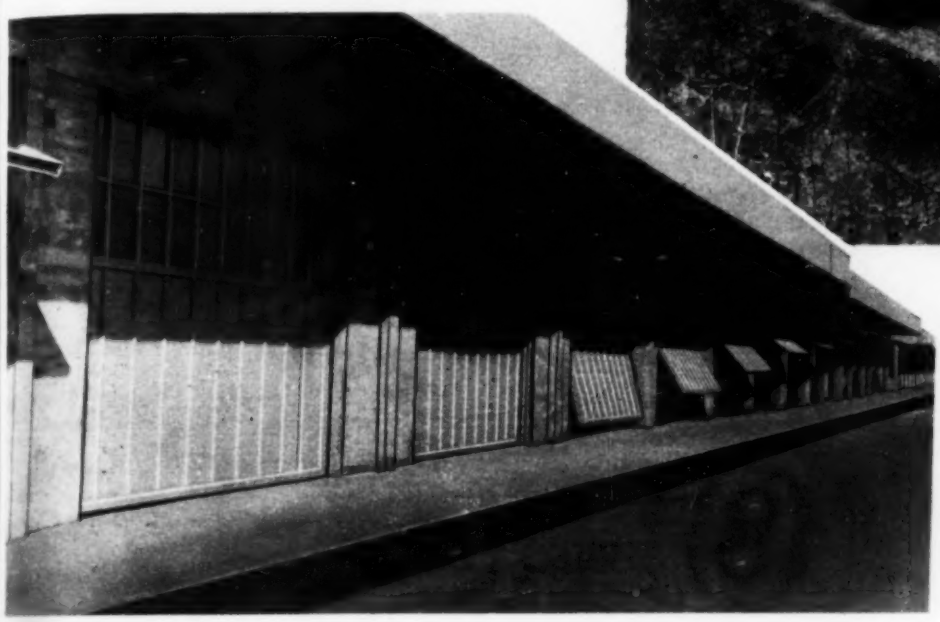
SINGLE-DIAL PRESET CONTROL for setting current enables this new Flexarc d.c. portable welder, designed for general service, to maintain constant arc in spite of speed changes of driving motor caused by line fluctuations. Lower open-circuit voltage provides safety for operator, and retains all desirable arc characteristics associated with high open-circuit voltage. Moment arc is struck, set adjusts itself immediately to required preset value. Elimination of exciter from design reduces no-load losses. New magnetic control principle for welding generator obviates need for field rheostat, exciter, or external reactor and allows accurate adjustment of welding current by mechanical control. "Nofuse" circuit breaker prevents fuses from blowing out and coils from burning up.—Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

2,200-LB TACKLE BLOCKS (*below*) used in erection of 300,000-lb. fractionating tower at Curacao, D.W.I. Two upper blocks (with shackle) fit over 4½-in. pin while two lower blocks fit into yoke on either side of tower. Blocks have ½-in. plates, 8x¾-in. side straps, 3-in. head bolt, 3-in. sheave pin and 2-in. bottom bolt. Cast steel sheaves are 24-in. in diameter for 1-in cable. Bushings are keyed into sheaves. Four extra heavy cast-iron separators fastened with eight bolts are placed between each two plates to insure exceptional stiffness and rigidity. Lower block has two 8x¾-in. straps in center and four 8x1¼-in. straps on outside. Two eyes of yoke fit between four outside 8x1¼-in. hanger straps. Blocks were shipped 16 days after receipt of order.—W. W. Patterson Co., Pittsburgh, Pa.



METAL TREADS for single pneumatic tires give added traction in mud, sand, ice and snow. Wearing shoes are of alloy steel castings and links and pins are of heat-treated steel. Pins easily removed. Master link allows adjustment to compensate for tire wear. Inside of tread plate is smooth and curved to fit tire, preventing slipping and chafing. —W. A. Riddell Co., Bucyrus, Ohio.

HEAVY DUTY MOTOR GRADER (*right*) powered by diesel or gasoline engine, has all-welded box-type frame and drawbar which provides strength and rigidity against bending and twisting stresses and holds ends of blade firmly to ground so that it cannot rock and ride over hard spots. Simplicity of design enables operator to see full length of blade at all times. High arch in frame allows vertical movement of blade from 6 in. below wheel level to 18 in. above. New-type lateral shift permits sidewise movement of blade 19 in. either way from center. Blade reach increased 12 in. either way by shifting moldboard on blade circle. Each axle is independently driven by roller chain, and thus each wheel helps pull others over bad spots. Tandem drive provides traction desirable in ditch work and in soft and uncertain going. May be had with dual-tired two-wheel drive or with 4 or 8 wheels arranged in tandem.—J. D. Adams Co., 217 S. Belmont Ave., Indianapolis, Ind.



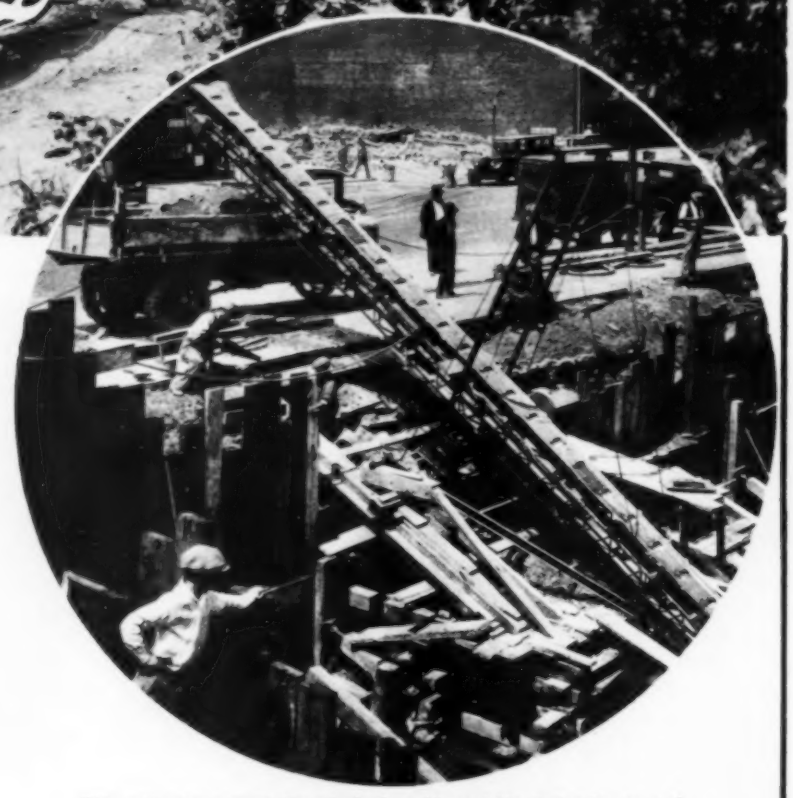
448 ONE-PIECE CANOPY DOORS (*left*) were installed in recently completed Bronx Market this year by New York City Administration because it decided that these doors would facilitate prompt handling of produce. Canopy doors open upward, take no floor or wall space and operate with ease and speed. They are made of cypress, wood being set in steel channel frames for 14-ft. wide openings and are counterbalanced with cast-iron weights. Upper half of each door is glazed. About fifty inner doors are equipped with wicket or pass doors wide enough to truck a barrel through and supplied with special hinged truckable sills. Turner Construction Co., general contractor for market buildings, set inserts in concrete jambs and doors were erected by two men at average rate of one door per hour. Jambs, heads and sills are equipped with tight weathering devices and new operating handles which automatically latch doors open when needed.—Cornell Iron Works, 36-20 13th St., Long Island City, N. Y.

MOTOR-TRUCK SHOVEL (*right*) has tubular shipper shaft on boom equipped with rope crowd which assures positive digging action and makes an efficient unit for cleaning up road slides and slips, blind curve eliminations, sloping and dressing banks, roadside borrow pit work, making channel changes, light grading, digging and cleaning ditches and similar jobs. Gasoline-powered, one-man-operated, full-revolving unit. Built in lifting capacities of 6½ to 8½ tons. Can handle crane booms up to 55 ft. May be equipped with ½-yd. clamshell or dragline buckets or with ¾-, ½- or ⅜-yd. shovel boom. Easily attached to most standard-make motor trucks.—Universal Crane Co., Lorain, Ohio.

CEDARGRAIN ASBESTOS SHINGLES designed for use as siding for houses. Made of asbestos fibres and Portland cement and claimed to be fireproof, permanent and free from upkeep expense. Silver gray in color and do not require paint or other preservative. Produced in three designs including tapered or uniform thickness with either wavy or staggered butts and a uniform thickness type with even butts. Many architects prefer tapered thick butt shingles because of unusually deep shadow lines they create. May be used in new construction or in modernization. Can be applied to any existing siding (to which they can be nailed) or to furring, as illustrated.—Johns-Manville Co., 22 E. 40th St., New York City.

SMALL, 10-TON full-revolving shovel (*left*) (⅜-yd. bucket capacity) has all advantages of heavy-duty models, among them: (1) Compactly designed but allows plenty of elbow room; (2) useless deadweight eliminated by alloy steels and heat-treating; (3) anti-friction bearings save lubrication and wear; (4) positive and independent chain crowd; (5) drop-forged crawler shoes (14-in. wide and long-wearing); (6) nickel manganese steel, heat-treated, unit-cast car body and machinery table; six-cylinder gasoline or diesel engine with "E-Z" clutch control; (7) cut helical gears on all drum shafts; (8) safety worm boom hoist; (9) positive propelling lock; (10) all controls from operator's seat. Can handle 4-ton crane loads at 12-ft. radius.—Bay City Shovel Co., Bay City, Mich.

Cutting Handling Costs Via Barber-Greenes



This contractor removed the wheels from his portable Barber-Greene, and set it up as shown for removing material from a basement excavation. Later the wheels were put back and the machine handled aggregates. On another job it conveyed concrete. Later bagged cement and so on through a long list of money-saving set-ups.

LET Barber-Greene Conveyors turn a cause for expense into a source of profit.

Barber-Greenes are pre-engineered. Stock trusses, drives, take-ups, etc. are available in the correct pre-designed size for your peculiar needs.

Barber-Greenes are Standardized. B-G Sectional Construction makes for easier erection, perfect flexibility. B-G's can be lengthened, shortened, or otherwise altered to meet job changes, or entirely new set-ups.

Barber-Greenes are carried in Stock. Our standardized Sectional Construction permits us to fill your order promptly from stock. This is important in contracting, and doubly important when you want additional parts to lengthen your machine or make other changes to suit new conditions.

Barber-Greene maintains a department for the sole purpose of solving your more difficult handling problems the most efficient and economical way.

Whether you need a few idlers, a 20' portable, or a 2,000' permanent installation, you can not do better than with Barber-Greenes. A call, card, or wire will bring full details without cost or obligation.

Standardized Material Handling Machines

BARBER GREENE

530 West Park Avenue
Aurora, Illinois

30-7

Find out what's happened in the Crawler Tractor Field

Above: Three International Model T-20 TracTracTors. The compact, powerful T-20 is known as the tractor that brought new accessibility and new economy to the crawler field. It is available with a wide variety of equipment.

International Harvester Industrial Power:

Powerful crawler and wheel tractors (gasoline and Diesel)

Compact small tractors to handle difficult jobs in cramped areas

Power with built-in equipment of great variety

Fixed power units (gasoline, kerosene, and Diesel), 15 h. p. to over 100 h. p. for a wide variety of utility

Engines for light duty, 1½ to 5 h. p.

● International Harvester standards of mechanical excellence, accessibility, operating economy, and nation-wide service—through Company-owned branches and well-established dealers—are the standards by which industrial power is judged these days. In every field where mobile and stationary power is needed, users have welcomed the crawler tractors, wheel tractors, and power units produced by the world's largest tractor builder. As a result, you see International Harvester Industrial Power wherever you go—and you find operators who are enthusiastic over its performance. Specific information will be supplied on request.

INTERNATIONAL HARVESTER COMPANY
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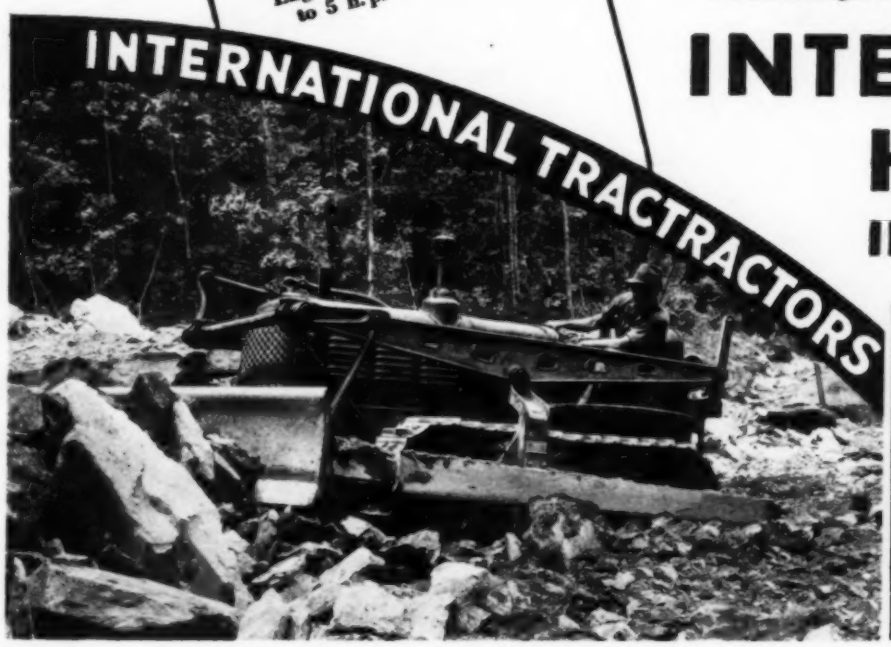
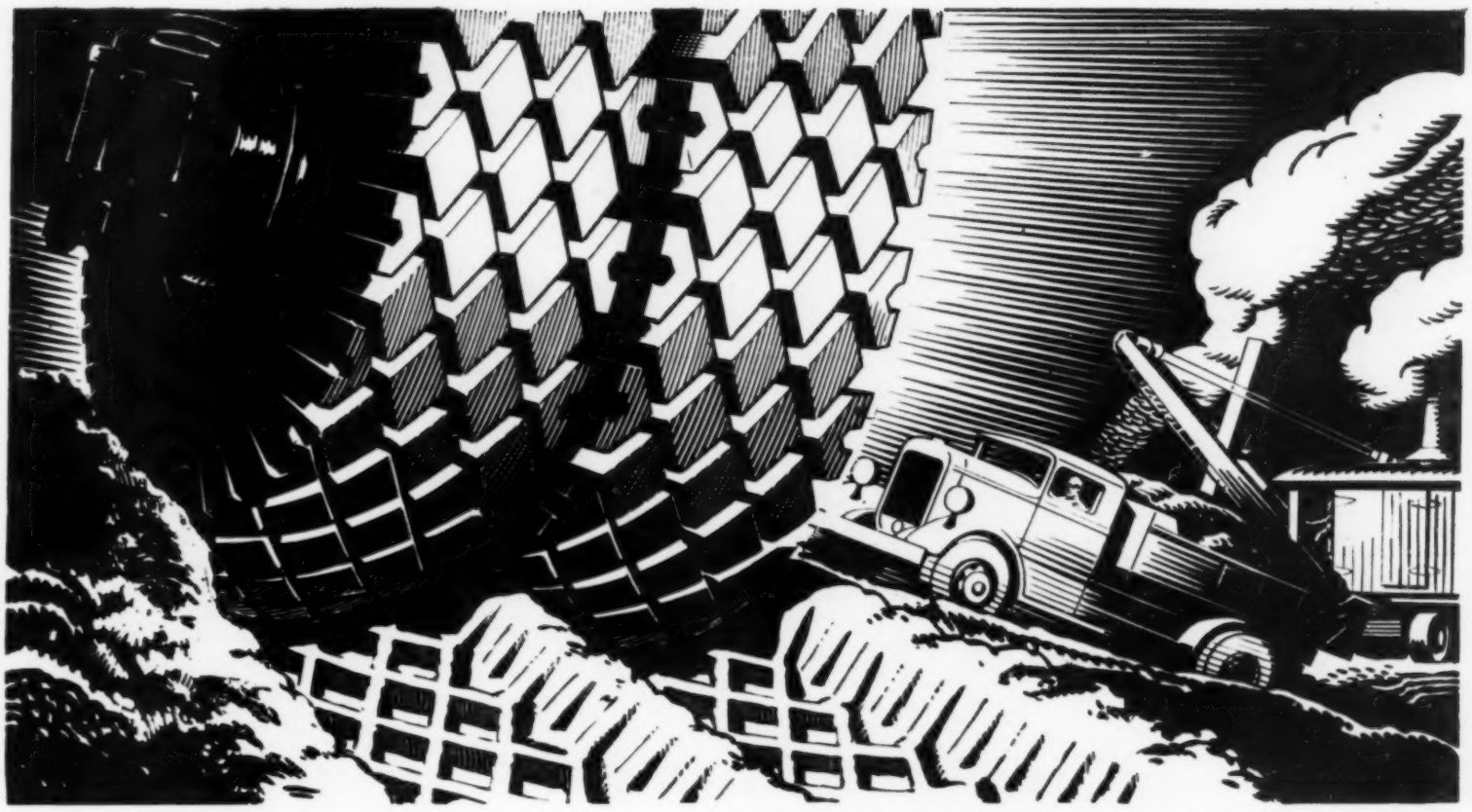


INTERNATIONAL HARVESTER
INDUSTRIAL POWER

International DIESEL Power

The International Diesel engine in the TD-40 TracTracTor and the PD-40 Power Unit makes remarkable savings compared to other forms of power. Its great economy is due to low-priced fuel, to the relatively small quantity of fuel it requires, to its high combustion efficiency, and to its low maintenance cost. Investigate the International Diesel, which starts as a gasoline engine and converts itself automatically to Diesel operation.



THIS TREAD* SAVES MONEY FOR DUMP TRUCK OPERATORS

GOODYEAR DUMP TRUCK ALL-WEATHER TIRE BUILT FOR SEVERE SERVICE

For heavy construction hauling, excavation work, for service that requires trucks to operate both on and off the road, Goodyear builds the Dump Truck All-Weather Tire. It will bring to your trucks better traction and long, dependable, economical operation.

Examine it. You'll like that All-Weather tread that grips and pulls in any ground. You'll like those heavy, tough bars extending down the sidewalls. They provide added traction in ruts, protection from cutting and scraping on sharp rocks and rough surfaces.

You'll appreciate, too, the many other money saving features of this Dump Truck Tire that is built with these additional superior features that have gained for Goodyear Truck Tires the name MONEY SAVERS.

- **SUPERTWIST CORD**—greater body strength.
- **EXTRA-STRONG BEAD CONSTRUCTION**—for heavy, swaying loads.
- **HEAT-RESISTING RUBBER**—long wear, blow-out protection.
- **PIMA COTTON**—longest cotton fibre grown.

Ask your Goodyear dealer. He'll be glad to tell you more about this money-saving Goodyear Dump Truck Tire.

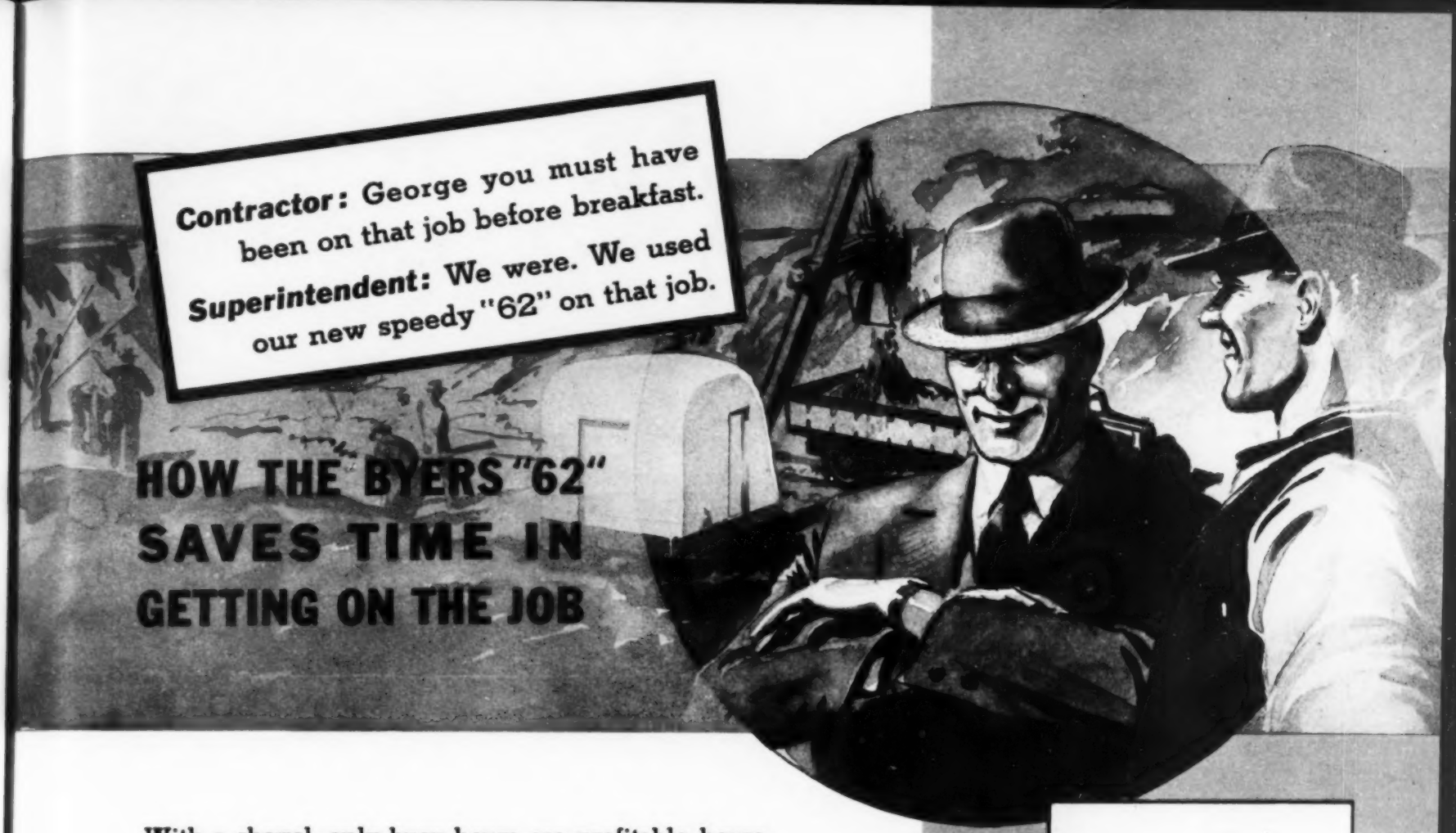
***ALL-WEATHER TREAD**

Most scientific tread design ever developed. Deep-cut diamond blocks provide better traction, better grip and pull, better non-skid protection. Broad and flat, presenting more surface to the ground, providing easier rolling. Tough rubber for long wear.

Proved in over twenty-five years' service. Exclusive with Goodyear.

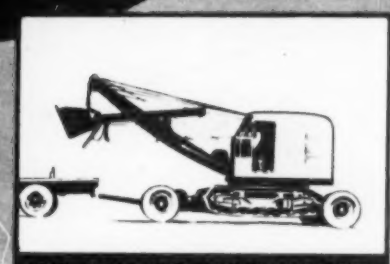
THE GOODYEAR TIRE & RUBBER COMPANY, INC., AKRON, OHIO

GOODYEAR TRUCK TIRES money savers

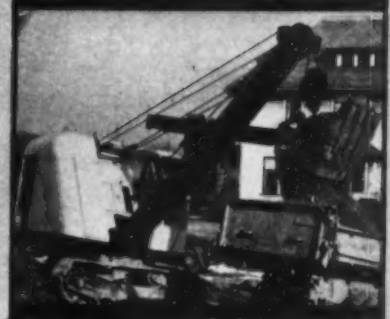


HOW THE BYERS "62" SAVES TIME IN GETTING ON THE JOB

With a shovel, only busy hours are profitable hours. Saving time moving from job to job saves wages and adds digging hours. That's why contractors using a Byers "62" and its trailer, designed for 30 to 35 m.p.h. transportation speed, make money where profits do not ordinarily exist. • This moving speed puts every job within a radius of 75 to 125 miles in the profit class. Savings on seven or eight hauls easily pay for this trailer. • On the job, Byers "62" engineered with Timken roller bearings—one second power trip—power operated clutches—a marvelously efficient cab and many other features—opens up new fields for half-yard shovels. Write today and we'll tell you how Byers "62" enables you to eliminate your competition.



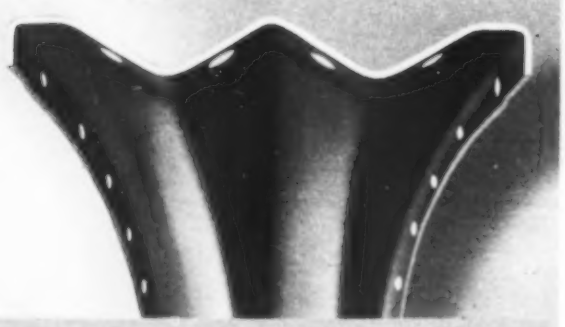
25 MILES PER HOUR
ON ITS OWN TRAILER



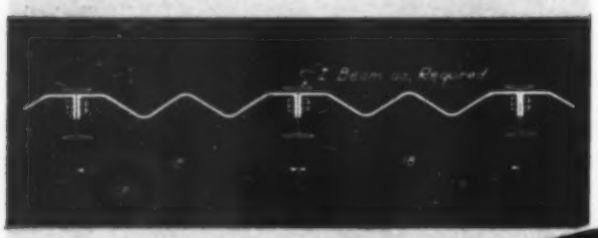
YOU CAN'T BEAT IT
FOR PORTABILITY

BYERS
MACHINE CO.
RAVENNA, OHIO

It carries the load



End view of plate section showing how strengthening corrugations run full length. On a pound for pound basis this well-balanced design eliminates weak joints and provides the strongest steel plate available. The result is greater utility plus a lower installed cost for the same strength arch or conduit.



The extra strength of Armco Structural Steel Plate Linings is fully utilized when used in combination with structural shapes. For large openings that require reinforcement, these plates are perfectly adapted to assembly with rolled sections, tees and I-beams placed between adjacent rings.

Now you can save money and simplify the job. You can do it with Armco Structural Steel Plate Lining. Its balanced design makes for maximum strength, with minimum weight of metal. This cuts your first cost on a pound for pound basis. The necessity for structural reinforcements is greatly reduced.

But there is more to Armco Steel Plate Lining than just economy of weight for any specified load-carrying capacity. The plates are easily handled and quickly assembled on the job. Less preparatory work, such as excavating, is required. Plates are interchangeable and come fitted ready for installation. Once installed they reduce fire hazards, an important point where compressed air is used. You are assured of a better line and grade as well as strict adherence to specifications.

Write for a copy of our useful booklet, and tell us about any job that's coming up. Ingot Iron Railway Products Co., Middletown, Ohio; Berkeley, California.

Armco Steel Plate Linings

Pound for Pound it's the Strongest Plate

No muss and fuss attends the forming of walls for Georgia's new State Prison. Large panel forms, lifted from story to story, are used. Tucker and Howell, architects, Atlanta; Struck Construction Co., contractor, Louisville; Robert Fiske, structural engineer, Atlanta.

Contractors who can capitalize on the growing acceptance of

ARCHITECTURAL CONCRETE

Buyers of new buildings everywhere are fast awakening to the possibilities of Architectural Concrete. More and more they are demanding this modern building method that permits the casting of the whole structure — walls, frame, floors, ornament and all — *monolithically*, in one economical material.

Architectural concrete adds beauty and distinction to firesafety and long life with low maintenance. The first cost? Very moderate. Bids for the Georgia Penitentiary showed concrete 15% lower than the nearest competitive material. No wonder it is being chosen for scores of commercial structures, factories, schools, public buildings and homes.

There'll be new buildings in your market designed in architectural concrete this year. National advertising in such papers as *Fortune* and *Business Week* that reach the "key" men in industry and public life . . . is spreading the news about this fast-growing type of construction.

Are you prepared for these jobs? The technique is not difficult. Send today for Information Sheets and the new book, "*Forms for Architectural Concrete*"— a 64-page handbook on equipment, layout, procedure, selection of materials and details.

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Please send literature checked:

☐ "Forms for Architectural Concrete"

☐ Information Sheets on specifications and other details (AC series, 1 to 12)

Name .....

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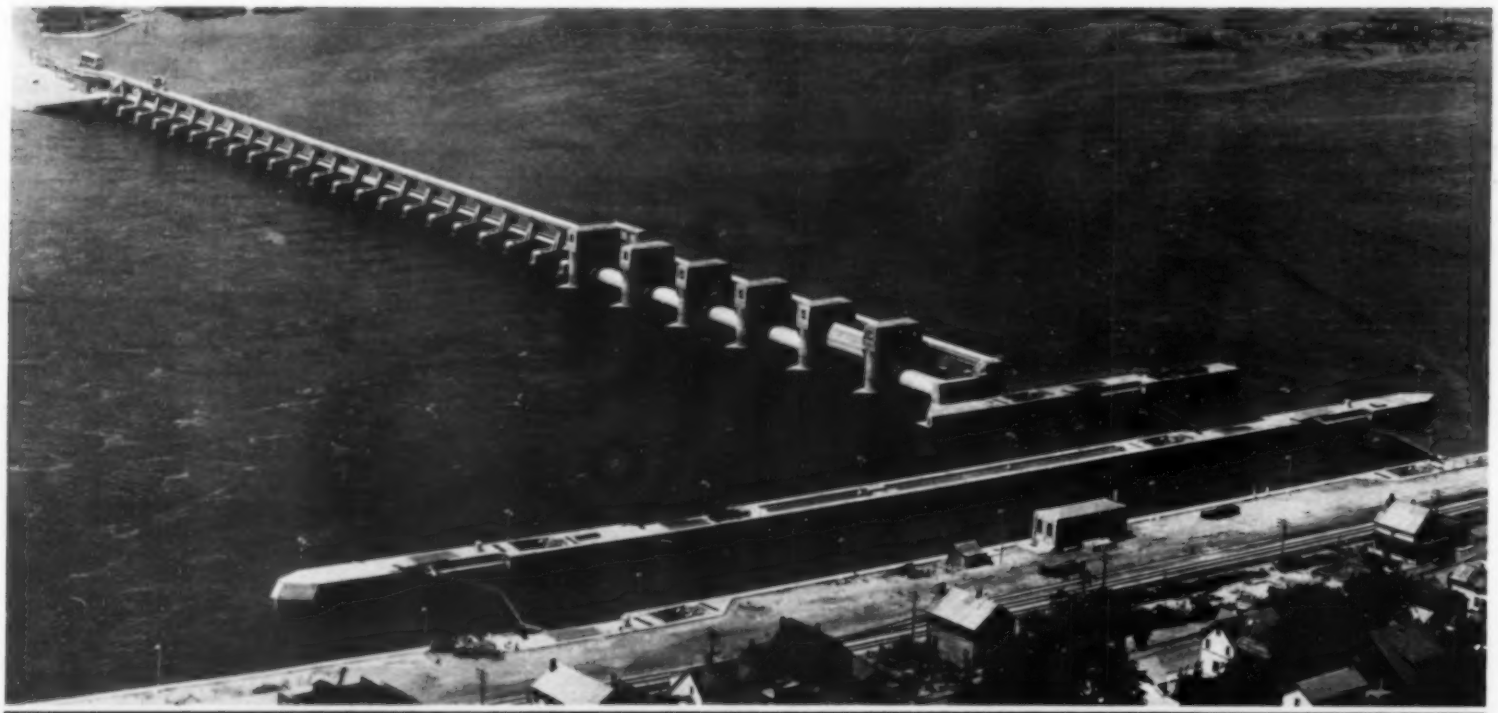
In Alma Dam and Lock,

Upper Mississippi River Canalization Project



BETHLEHEM *Steel Sheet* PILING

ONE of the most far-reaching river improvement projects ever undertaken is in progress on the upper Mississippi. At Alma, Wis., at Alton, Ill., and at 21 other points along its shallow, island-filled upper reaches, locks and dams are rising to form a 9-ft. channel, 300 ft. wide and 650 miles long.

To establish controlled pools and guard against the possibility of excessive flood damage, dams below the Twin City Dam are of the low, movable type, with tainter or rolling gates. Two views of Lock and Dam No. 4 at Alma, first part of the project to be completed, appear on this page.

Bethlehem Steel Sheet Piling was used throughout in the construction of this dam and lock—for the box-type cofferdams, for the dikes connecting the dam to the shore, for the permanent cut-off wall under the lock walls and along the dam. The total tonnage of Bethlehem Piling was 5100 tons, of which 3600 tons are permanently installed.

At several other points along the Mississippi River the strength of Bethlehem Steel Sheet Piling, its permanence, economy and easy-driving qualities have led to its use for identical purposes. There are projects in many localities, involving the retention of earth or water, in which Bethlehem Steel Sheet Piling offers an equally simple, economical solution of the problems involved.

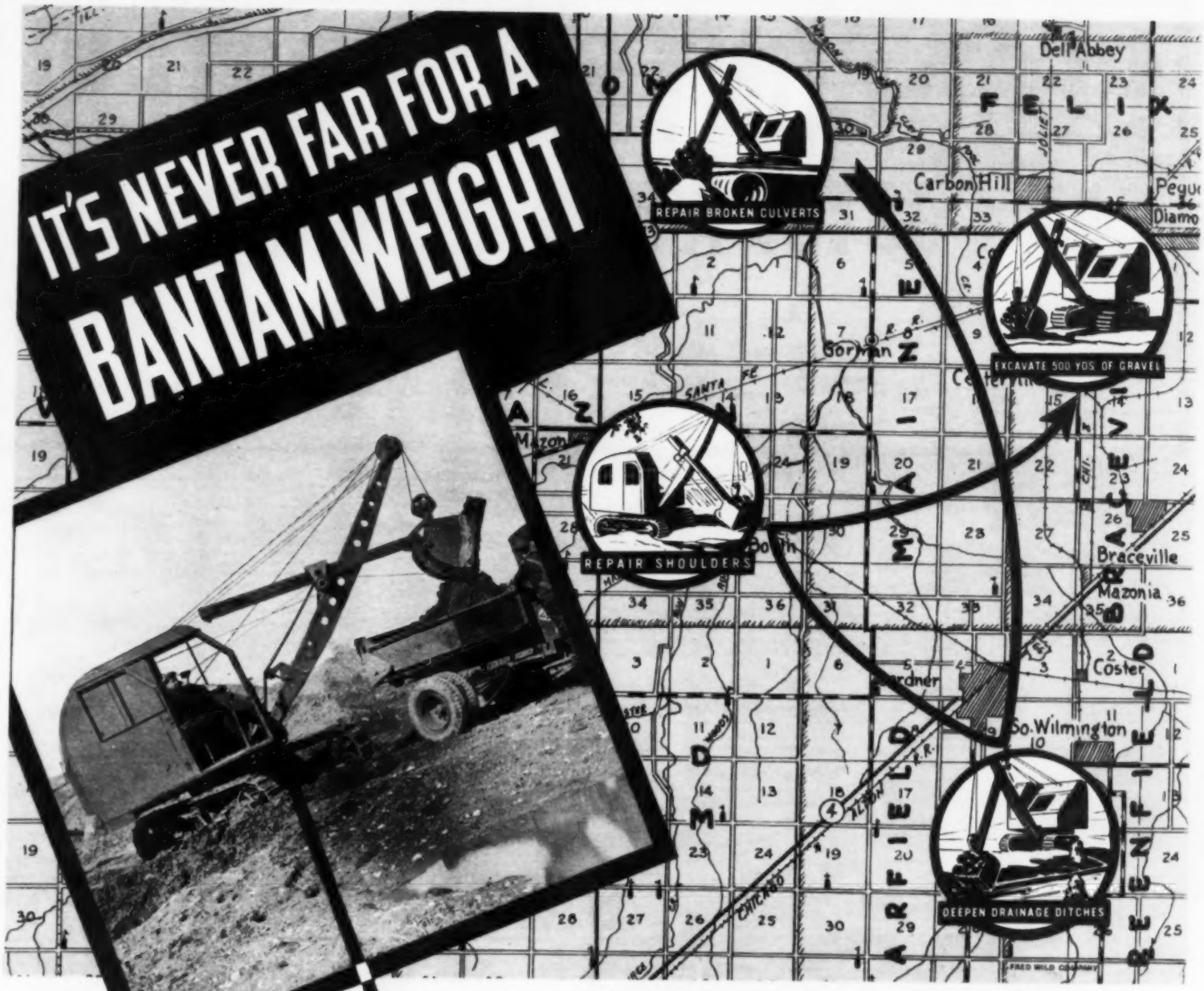
Bethlehem Steel Sheet Piling was used in the box-type cofferdam and in the cut-off walls beneath lock and dam.

United States Engineers' Office, St. Paul, Minn.; United Construction Company, General Contractors.

BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY

GENERAL OFFICES: BETHLEHEM, PA.



"Street shoes" are available and are easily attached to protect against damage from crawler treads. The Bantam Weight can travel on hard surfaced roads, soft roads, over bridges; most anywhere.

HERE'S an excavator made for maintenance jobs. Five minutes will see it on a trailer and off to travel safely over secondary roads and small bridges. The Bantam Weight's built like a streamlined train—high tensile alloy steels give it greater strength with far lower weight. All welded construction has simplified design, reduced inertia-losses, provided a digging cycle that's 'most as fast as a man can swing a scoop shovel. For a hundred highway jobs, the Bantam Weight's an ideal tool . . . so fast in getting to a job that it shrinks a county by miles . . . so fast in getting through a job that it means higher production per day's work. And at a price that's easy to fit into budgets. Send for information today.

HARNISCHFEGER CORPORATION

4494 W. NATIONAL AVE. *Established 1884* MILWAUKEE, WIS.

Warehouses and Service Stations: Hoboken—Memphis—Jacksonville—Seattle—Dallas
Los Angeles—San Francisco

P&H BANTAM WEIGHT
FIRST TO THE JOB — AND FIRST THRU
ONE OF THE 22 P&H PACEMAKERS FOR 1936

BEAT CONTRACT DATES!
CUT COSTS! AVOID BREAKDOWNS!

Modern Alemite Lubrication Helps Costly Equipment Take The Terrific Punishment of Today's Construction Schedules!

● Using an Alemite Service Gun to introduce valve plug sealing compound through Alemite Giant Button Head Fittings on a Rex Pumpcrete concrete pump. The Alemite Hydraulic System is provided for all bearing lubrication on this machine.

● On gigantic construction projects like Boulder Dam, where time runs into money fast, you'll find machinery kept in perfect running order with the help of Alemite Controlled Lubrication.

HURRY! HURRY! HURRY! The job must be kept to schedule! Men and machines are pushed to the limit—and beyond—keeping pace with the eternal demand for speed on vast construction enterprises. When men give way, other men are ready to step in. But when machines break down through inadequate lubrication—mounting penalties threaten!

That's why over 95% of today's construction equipment comes fitted for modern Alemite Lubrication! Here, for instance, is a Rex Pumpcrete—a concrete pump of the type used at Boulder Dam and the Mississippi River Project—ready to move 35 cubic yards of concrete per hour—to lift it 65 feet vertically, or send it 800 feet away horizontally!

Such a machine must keep on working! The valves must perform without a hitch! That's why an Alemite Gun is used to introduce valve plug sealing compound, through Alemite Giant Button Head Fittings.

These fittings were selected because of their ability to receive a large volume of lubricant or compound in a short period of time. They can take the same kind of punishment the whole machine must stand—the kind any machine must stand on a modern construction project!

Mixers—tractors—shovels—graders—there's an Alemite System for every type of construction equipment—to help you beat contract dates, cut costs, and avoid expensive breakdowns! *Be sure* that every bearing—on every machine—is equipped with this modern insurance against lubrication troubles! The cost of replacing old-fashioned grease cups and other doubtful lubrication devices with modern Alemite fittings is too small to make a gamble worth while! Use Alemite Equipment, and *know* that the lubricant is reaching all bearing surfaces—forced there by Alemite's enormous pressure. Our lubrication experts are at your service! Write to us!

ALEMITE

REG. U. S. PAT. OFF.

CONTROLLED LUBRICATION

ALEMITE—*A Division of Stewart-Warner Corporation*
1840 Diversey Parkway Chicago, Illinois
Stewart-Warner-Alemite Corporation of Canada, Ltd., Belleville, Ontario, Can.

Enjoy Horace Heidt and his Alemite Brigadiers every Thursday at 10:00 P. M. Eastern time on Coast-to-Coast Columbia network.

TIRE TORTURE NEVER STOPS-
Proves Value of New Goodrich Invention

The tires never even get a chance to cool off. It's load up and drive—load up and drive—24 hours a day, seven days in the week.

This huge truck hauls gold concentrate from the Big Canyon Mine near Placerville, California, to Stockton, 100 miles away. With the price of gold high, mines work overtime, the metal must get to market in a hurry.

Can't Take Chances

So valuable is the truck, the owners, the United Motor Transport, keep a new Diesel engine in reserve, ready and waiting for instant replacement. They can't take chances on tires either. Schedules are fast. Roads are rocky. Curves are sharp. So every tire on the job is a Triple Protected Silvertown—built for just such heavy-duty service as this.

Tires Triple Protected

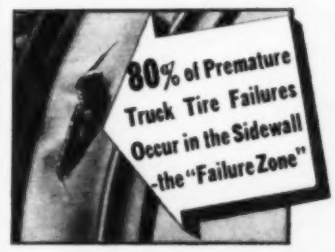
The new Silvertowns actually check 80% of premature failures! A revolutionary invention built into the sidewall guards against blow-outs and road delays. This is the tire that's being used on the world's toughest hauling jobs. If it stands up under that kind of punishment, surely it will do a better job for you, too. Start checking up now. Find out more about the biggest tire development in years—the costly invention that is saving every user money—yet does not cost truckers one cent extra.

HOW TRIPLE PROTECTION WORKS

1 PLYFLEX—a *new*, tough, sturdy rubber material with greater resistance to stretch. A layer of Plyflex in the sidewall prevents ply separation—distributes stresses—checks local weakness.

2 PLY-LOCK—the new Goodrich way of *locking* the plies about the bead. Anchoring them in place. Positive protection against the short plies tearing loose above the bead.

3 100% FULL-FLOATING CORD—Each cord is surrounded by rubber. With ordinary cross-woven fabric, when the cords touch each other, they rub—get hot—break. In Silvertowns, there are no cross cords. No friction.



Goodrich *Triple Protected* Silvertowns

SPECIFY THESE NEW SILVERTOWN TIRES FOR TRUCKS AND BUSES

CHEVROLET TRUCKS

lead all trucks in their price class for

PULLING POWER

FOR ECONOMICAL TRANSPORTATION

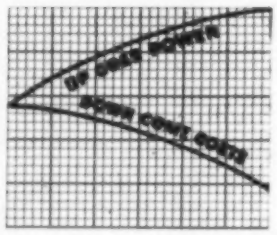
Chevrolet trucks prove stamina and record-breaking economy in amazing coast-to-coast run

Look at this great record

Location of Test	Los Angeles to New York
Distance Traveled	3511.5 miles
Running Time	129 hours, 24 minutes
Average Speed	27.14 miles per hour
Gasoline Used	308.6 gallons
Gasoline, miles per gallon	11.378
Oil Consumption	2 quarts
Cost of Fuel	$57.59
Cost of Oil	$.67
Fuel and Oil (cost per mile)	$.016
Average cost per ton mile	$.00328
Water Consumption	1 gallon

No mechanical failures

Entire test conducted under supervision of A.A.A. Contest Board —Sanction No. 3300.



No other truck in the entire low-price range equals the Chevrolet 1½-ton truck for *pulling power!* And yet this is just one of many advantages contributed by the Chevrolet High-Compression Valve-in-Head Truck Engine. It offers unmatched economy of operation—high gasoline mileage and low oil consumption. For dependability it is unsurpassed by any truck in its price range. That means low maintenance cost, too!

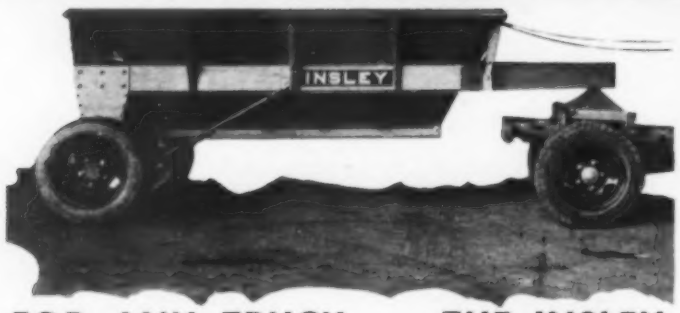
Perfected Hydraulic Brakes—the kind that are always equalized—give great and reliable stopping power. The Rear Axle is of Full-Floating design—rugged and durable in construction. And the Cab is Full Trimmed—designed for real driver comfort.

Chevrolet trucks are the *world's thriftiest high-powered trucks.* Give them a trial—with your kind of loads. Your Chevrolet dealer will arrange such a test at your convenience.

CHEVROLET MOTOR COMPANY, DETROIT, MICHIGAN

GENERAL MOTORS INSTALLMENT PLAN—
MONTHLY PAYMENTS TO SUIT YOUR PURSE

TWO REMARKABLE INSLEY PRODUCTS



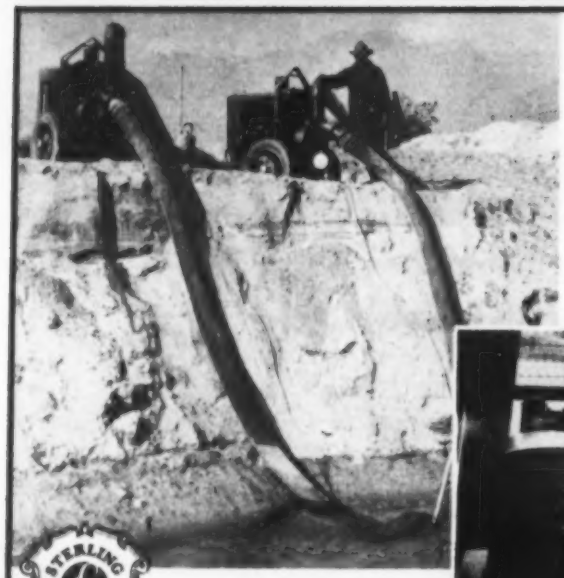
FOR ANY TRUCK . . . THE INSLEY SEMI-TRAILER DUMP WAGON

IT'S FAR easier to pull a load than it is to carry a load. That's one reason why the Insley semi-trailer dump wagon is so valuable to contractors. Tests have shown that it will haul twice as big a load as the conventional type dump truck. It is easily adaptable to any truck, its capacity is 5 cubic yards and it has such outstanding features as drop-bottom doors, opened by a clutch and closed by a power wind-up — both operated from the cab. Already there is a big demand for this type of equipment. It will pay you to get complete details concerning the Insley semi-trailer dump wagon.

NEW INSLEY ROCKER HAND DUMP CART

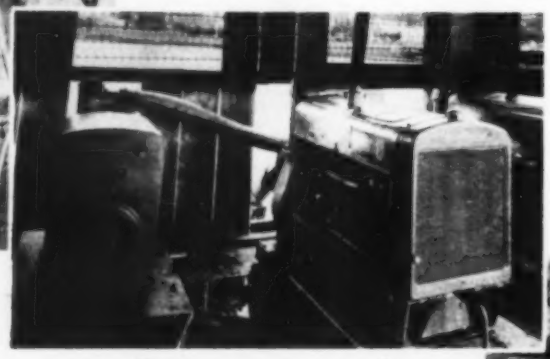
HERE IS the newest Insley product — a hand dump cart with all the advantages of pneumatic tire construction, yet with none of the disadvantages in dumping that usually come from lowering the center of gravity. This is made possible by two rockers on the front that have approximately the same radius as the old-type 42-inch wheels. These rockers make it far easier for the operator to dump the load. They increase the efficiency and speed with which the job may be completed and overcome every objection which any contractor may have to pneumatic-tired hand dump carts. Write for full details.

INSLEY MANUFACTURING CORPORATION — INDIANAPOLIS, INDIANA
Engineers and Manufacturers of
All Types of Shovels, Cranes, Derricks, Drop-Bottom Trailers and Modern Concrete Handling Equipment



20 STERLING PUMPS IN USE ON ONE JOB NEAR LOS ANGELES

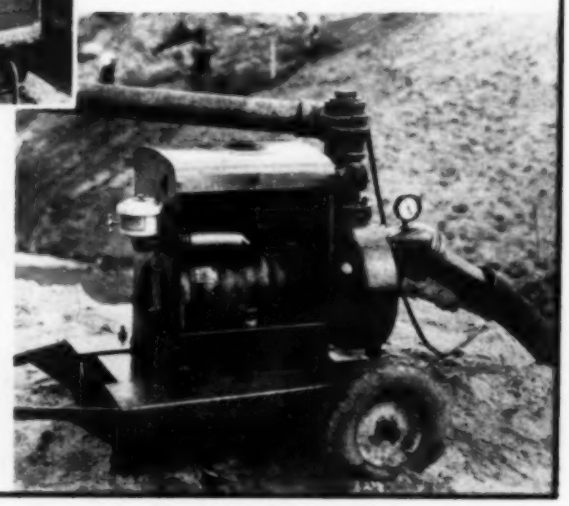
The "on the job" pictures shown here were taken in the vicinity of Los Angeles, California, where twenty Sterling Pumps on the job are working day and night pumping flood waters. These pumps operating continuously twenty-four hours per day are proving again the value of good equipment, but this is only one of many instances in which Sterling Pumps are giving Sterling service. Consistently dependable performance is a Sterling characteristic.



STERLING QUALITY

DEPEND upon Sterling Pumps for your jobs

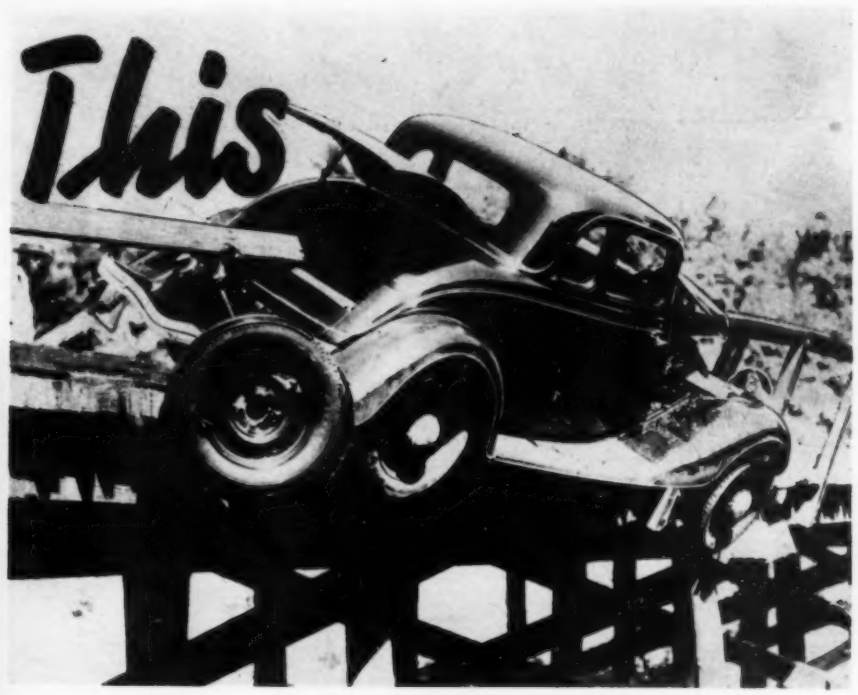
SIMPLICITY and RUGGEDNESS enable these Pumps to give continuous service under severe conditions. That is why America's leading contractors choose Sterling Pumps. Specify STERLING and be assured of successful performance by these THOROUGHLY TRIED and PROVEN PUMPS.



Sterling
MACHINERY CORPORATION
411-13 Southwest Blvd. Kansas City, Mo.

SIMPLE
DEPENDABLE
RUGGED

Stop This



....with Inland 4-Way Traffic Plates

Safety is one reason why Inland 4-Way Traffic Plates (patented) have been applied to so many bridges. The other reason is that 4-Way Plates restore an old bridge floor to serviceable condition —lengthening its life several years at low cost.

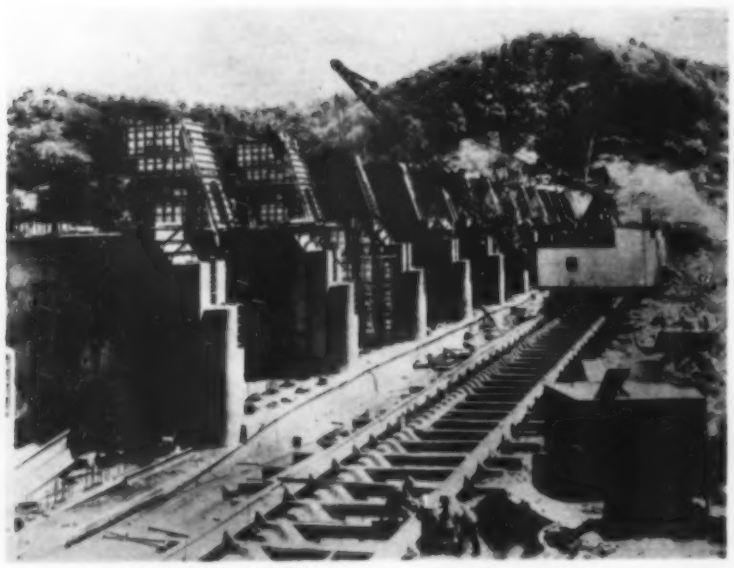
On the Inland 4-Way pattern, projections center one another at right angles. 4-Way grip—secure traction, safety against side skid. The thorough drainage of 4-Way Plates is also a safety factor in bad weather.

Projections on 4-Way Plates overlap one another both lengthwise and crosswise. This reinforces the plate, makes it just as stiff and strong lengthwise as it is crosswise—extra reinforcement for the bridge floor.

Inland 4-Way Traffic Plates are made in widths, lengths, and thicknesses for all highway requirements. Complete information mailed on request. INLAND STEEL COMPANY, 38 S. Dearborn St., Chicago, Ill.

INLAND STEEL

Sheets Strip Tin Plate
Plates Structurals Piling
Rails Track Accessories
Bars Rivets Billets



American Revolver on Dam No. 4, Mississippi River at Alma, Wis.—United Construction Co.

MEET OVERLOAD CONDITIONS WITH AMERICAN "REVOLVER"

On big construction jobs where output demands are unusually heavy and the cry is ever speed and more speed, the answer is super heavy-duty equipment like the "AMERICAN REVOLVER."

A full-revolving large capacity crane, the "REVOLVER" combines the range and stability of the derrick, the mobility of the locomotive crane, and the strength of the dragline. While simplicity is the keynote of its design, its rugged construction and air operated frictions insure speedy and easy operation and enduring service even under the most exacting conditions—a factor making for low cost operation and maintenance.

Especially ideal for bridge and dam construction, for heavy storage and cargo crane work, the "REVOLVER" is built in sizes capable of handling loads of from 7,500 to 50,000 pounds. It can be had for track, wheel, crawler, skid, ship, barge, or tower mounting and can be furnished with steam, gasoline, electric or Diesel power.

Write us today for our latest Bulletin No. 81, which describes and illustrates the "AMERICAN REVOLVER."

AMERICAN HOIST & DERRICK COMPANY
SAINT PAUL, MINNESOTA

AMERICAN-TERRY DERRICK COMPANY
SOUTH KEARNY, NEW JERSEY

AMERICAN REVOLVER

• DIGGING • LOADING • SUBGRADING • STRIPPING • CLEANING UP • BULLDOZING • LEVELING • EXCAVATING •

HERE'S A TRACTOR SHOVEL THAT CAN TAKE IT

— on *any* job. Rugged construction and simple operation assure long service. Easily digs and loads up to 30 cubic yards per hour—with only one man. 7-foot dumping clearance. Low operating cost and greater yardage bring bigger profits to every user. 3 heights, crawler or wheels, ½ or ¾-yard buckets, bulldozer attachment. Write for Catalog CM-4 to Trackson Company, Milwaukee, Wis., U. S. A.

• USE A TRACKSON HIGH SHOVEL

A DE-AIRED CONCRETE JOB

Photo shows an adjustable FLEX-PLANE Finishing Machine laying the concrete floor for a large industrial plant at Youngstown, Ohio — The Heller-Murray Company of Youngstown, Contractors.

The FLEX-PLANE Finishing Machine was equipped for de-airing the concrete, screeding, vibrating and installing the joints. The de-airing contrivance was built into the screed. With cavities arranged in the under-surface, the air was first pumped from the concrete into the cavities and then outwardly through a suction hose by a vacuum pump.

Something new every month—

FLEXIBLE ROAD JOINT MACHINE CO.
WARREN, OHIO

FIRST CHOICE

FOR HEAVY-DUTY HAULING RAIN OR SHINE

"THEY'RE GREAT FOR ROCK WORK, TOO!"

ATHEY Forged-Trak

Reg. Trade Mark

★ BUILT EXCLUSIVELY FOR CATERPILLAR TRACTORS

★ SOLD EXCLUSIVELY THROUGH CATERPILLAR DISTRIBUTORS

● Let it rain—the job won't stop if you're hauling with Athey Forged-Trak Two-Way Dump Trailers! They get through when others quit, regardless of muck or rocky ground. Two-Way Trailers dump clean. They dump fast. They dump to *right* or *left*. They are geared to the big dippers—built to take it. No wonder they are replacing "fair weather" hauling units wherever contractors want to get more work done . . . in shorter time . . . at a bigger profit. Let us show you why Athey Forged-Trak Two-Ways will pay on YOUR jobs!

ATHEY TRUSS WHEEL CO.

PIONEERS AND WORLD'S LARGEST PRODUCERS OF TRACK-LAYING WHEELS FOR LOAD-CARRYING PURPOSES

5631 W. 65th Street, Dept. J, Chicago, Illinois

Cable Address: "Trusswheel" Chicago

rough on tires!

GENERALS MAKE GREAT RECORD AT COLORADO RIVER AQUEDUCT

Hoist and dump trucks on the edge of the Mojave desert excavating for the construction of the Colorado River Aqueduct. Generals have played a big part in the gruelling grind of the several hundred trucks engaged in this tremendous undertaking.

● Temperatures of 120 degrees in the daytime—35 degrees at midnight—sand—sharp rocks—heavy loads—that's the test the Colorado River Aqueduct, now over 3 years in the building, has put on General Tires.

Can Generals take it? Several hundred trucks and field cars of the construction and engineering crews use Generals exclusively. Private contracting firms, doing portions of the work of throwing the 241 mile main aqueduct and 91 miles of tunnel through and across the barren waste lands of desert between the Parker dam site and the mountain ranges at the western terminus of the project, also are big users of dependable General Truck Tires.

Wherever the jobs are toughest, you'll find Generals. Your General Tire dealer has the most complete, most highly specialized line of truck tires in the business. He is a practical truck tire man with wide experience and accurate knowledge in fitting the right type and size of tire to every kind of job. This combination is worth real money to you. Call him in.

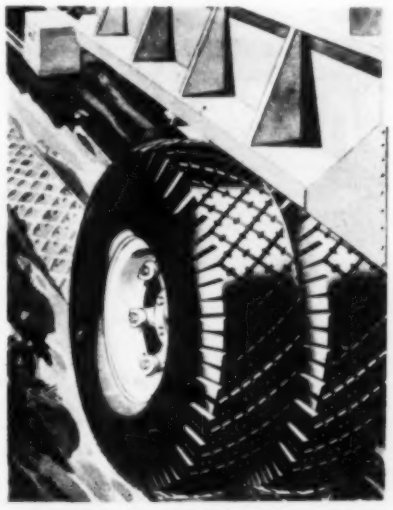
●

3 REASONS WHY GENERALS ARE MORE PROFITABLE TO YOU

1. Generals are stronger tires—additional full width plies of powerful cord are anchored bead to bead—with no "idle" plies—no floating breaker-strips.

2. Generals are cooler tires—they flex uniformly without that heat-producing "hinging action" of ordinary breaker-strip tires.

3. Generals have "compact rubber" treads—their construction keeps the tread rubber compact and compressed so that it wears slowly and gives more miles.



THE GENERAL HEAVY DUTY TRACTION BALLOON is made to order for the toughest construction jobs. It is only one of the complete line of Generals—each designed and built specifically to do a certain job better.

FREE

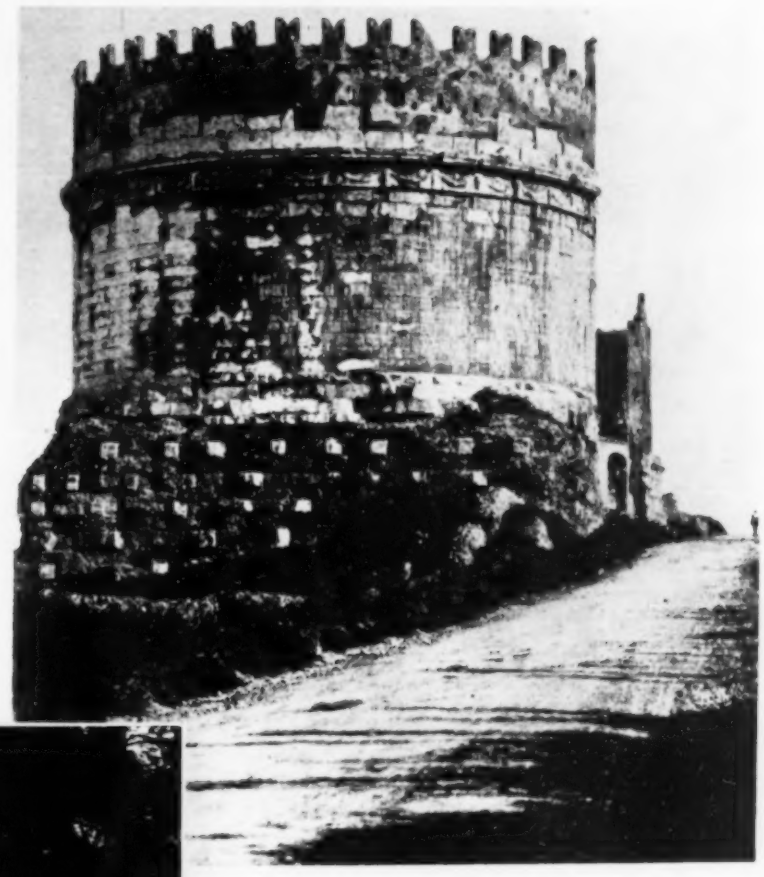
Read this booklet on how to avoid the more expensive tire troubles. Write to The General Tire & Rubber Company, Akron, Ohio.

GENERAL TRUCK TIRES

THE SECRET OF ROADS *that* LASTED 2100 YEARS

Now explained by the New

SCIENTIFIC "STABILIZED" SOIL MIX



Above—Recent view of Roman road past the tomb of Caecilia Metella

Left—Sandwich Fairgrounds stabilized road, De Kalb County, Ill.

MORE than two thousand years ago, the Romans knew that, by taking soils from various hillsides and valleys and putting them down in layers, they could build remarkably fine roads.

In recent years, government soil scientists have discovered how to test, classify and mix soils in proper proportions to build roads like these every time. The importance of this discovery lies in the fact that the needed ingredients are common soils, available in most all sections of the country. Much-cussed sticky clays and gumbos, shifting sands, sharp, fine stones and rolling gravels are the ingredients of most of the bad roads, where used alone. But when you put them together in proper proportions with moisture-regulating calcium chloride, the result is an all-year, firm surfaced highway costing little more than a poor road. Yet these new "stabilized" roads approach pavement in quality, with their firm, smooth and dustless surfaces.

Tested and approved by government and state highway departments, these stabilized roads are the answer to the highway engineers long standing need—a secondary road of highest quality at a price every community can afford. Hundreds of miles are being built by many states.

Technical bulletins are available, explaining how to find, test, prepare and place stabilized mix. Write for these bulletins today.

Calcium Chloride Association

THE DOW CHEMICAL COMPANY
Midland, Michigan
MICHIGAN ALKALI COMPANY
60 E. 42nd St., New York City
SOLVAY SALES CORPORATION
40 Rector St., New York City
THE COLUMBIA ALKALI CORPORATION
Barberton, Ohio

CALCIUM CHLORIDE

FOR STABILIZING ROAD SURFACES

"FAVORITE"

Reversible Ratchet Wrench

Of course you KNOW how the "FAVORITE" Wrench, with its back-and-forth streamline ratchet motion, *never leaving the nut till the nut is tight,* speeds up nut-turning. We couldn't improve that motion, so we improved the wrench — made it of better and stronger metal — handles, heads and pawls — and gave it a CADMIUM FINISH to improve looks and protect against rust.

NO LOST MOTION

is the secret of "FAVORITE" speed. Never leaves the nut until job is done. Can be used in narrower places than an ordinary wrench. Wrench heads interchangeable in handle. Now — get full particulars about the *new* "FAVORITE" — it will pay you — send the coupon today.

GREENE, TWEED & CO.
Sole Manufacturers
109 DUANE ST., NEW YORK

Mail this — learn why and how

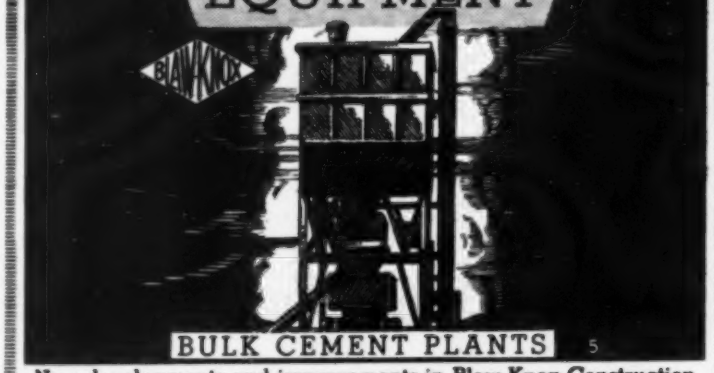
GREENE, TWEED & CO.
109 Duane St., New York City

I want to know more about the new and stronger "Favorite" Reversible Ratchet Wrench. Send me full details today. I want to turn nuts — Bolt size .....Sq. .....Hex.

Name .....

Address .....

BLAW-KNOX
ROAD BUILDING EQUIPMENT



New developments and improvements in Blaw-Knox Construction Equipment are right in step with today's program.

With a background of years of practical experience, Blaw-Knox equipment is trustworthy. It is economical and low in maintenance. Designed to stand up under severe operating conditions, it is fitted to the job by skilled engineers. It helps immeasurably to fulfill contracts speedily and profitably.

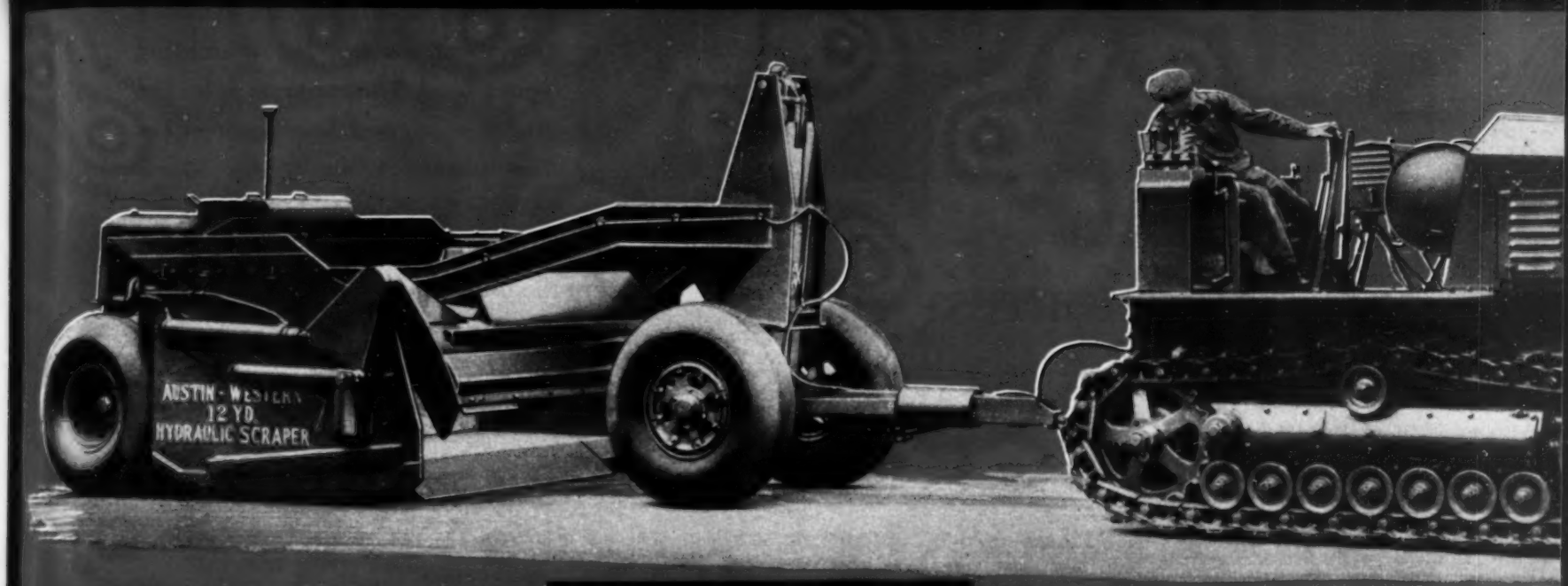
BLAW-KNOX COMPANY, 2086 Farmers Bank Building, Pittsburgh, Pa.
Offices and Representatives in Principal Cities

BLAW-KNOX ROAD BUILDING EQUIPMENT
Includes:—
BATCHERPLANTS · ROAD FINISH-SPREADERS
(Manuel or Automatic) · TRUKMIXERS
BULK CEMENT PLANTS · Trukmixer Loading Plants
ROAD FORMS · DIRTMOVERS · BULLDOZERS
STEEL STREET FORMS · TAMPING ROLLERS ·
ROAD FINISHERS · CLAMSHELL BUCKETS ·
(Gas-Electric) · CONCRETE BUCKETS
CEMENTANKS · STEEL BUILDINGS · STEEL GRATING
Literature on any of the above BLAW-KNOX Products will be sent upon application

Needed.. YET NO OTHER SCRAPER HAS BOTH

1 Full hydraulic controls magnetically operated from tractor; connect or disconnect in 20 seconds.

2 Separate motor operates scraper; no straining or stalling of tractor.



12-YARD SCRAPER *by* AUSTIN-WESTERN

● One man operates this 12-yard scraper easily. The powerful hydraulic controls are operated by remote magnetic control from the driver's seat of the tractor. Control connection between tractor and scraper is made as quickly as plugging in an ordinary electric lamp. No hose or cables—in 20 seconds the tractor may be detached and used for other work. This is an exclusive Austin-Western feature.

View of Scraper Loaded in Carrying Position

A separate power plant powers the hydraulic mechanism. With it there is no stalling of tractor or slowing down of operation. This is another important Austin-Western feature. Power door-closing and power unloading.

The Austin 12-yard Scraper is made for fast, continuous work under the most severe conditions. Special alloy steel increases capacity and lightens dead weight. Three-point suspension takes away strain from frame on roughest ground. Open top permits loading with shovel or elevating grader where desired. Extra high clearance for travel over broken ground.

The Austin-Western Road Machinery Co.

Home Office: Aurora, Ill. Cable Address: AWCO, Aurora, Ill.

Branches in 14 Principal Cities

Austin-Western

ROAD GRADERS · MOTOR GRADERS · ELEVATING GRADERS · DRAGS
ROAD ROLLERS · DUMP WAGONS · DUMP CARS
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The Austin-Western Road Machinery Co.
A-6, Aurora, Illinois
Please send me details on the 12-yard Scraper.

Name.....
Address..... 606-C
City..... State.....

"VENTUBE" DEMONSTRATES ITS ADVANTAGES AT 13,000 FEET IN THE PERUVIAN ANDES

"Ventube" Part of 600 Tons of Mining Equipment Flown Over the Andes to San Fernando Tunnel of Compañia Exploradora Cotabambas

Du Pont "Ventube", the flexible ventilating duct, has appreciated advantages of durability, flexibility, and ease and speed of installation. But in the development work being carried on in the San Fernando tunnel in the Department of Apurimac in Peru, no advantage "Ventube" offers has been more appreciated than its *lightness.*

For the first time in the history of the mining industry in South America, planes were used for the transportation of all the machinery. Low cost of transporting "Ventube" by air was not the least of its advantages to the Compañia Exploradora Cotabambas.

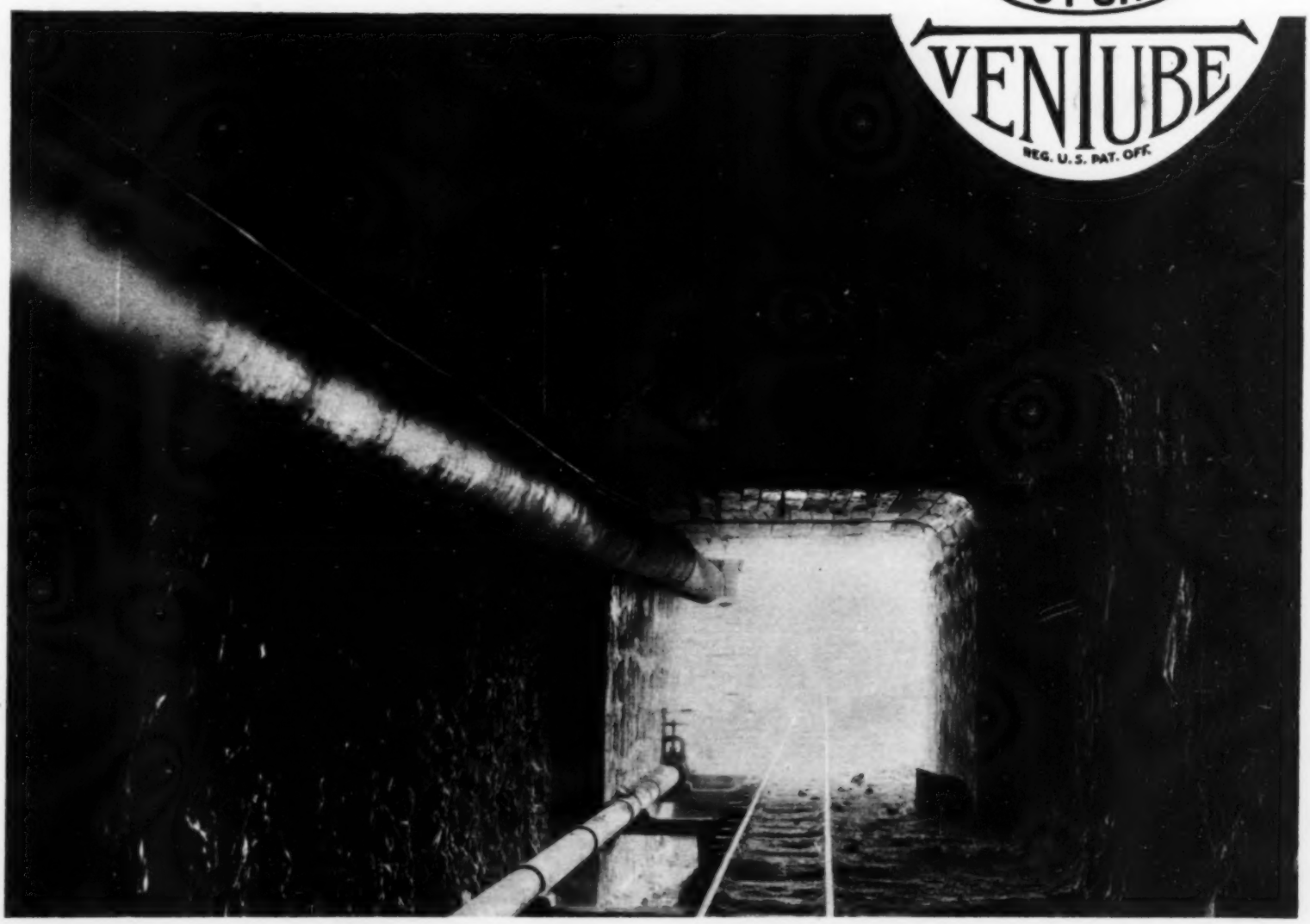
Operations are at 13,000 feet above sea level, making more essential than ever an abundant supply of fresh air.

The tunnel, when completed, will have a total length of almost two miles. Most of the driving is through solid rock, and the speed with which sections can be moved back from the working face at the time of blasting influenced the operators to use Du Pont "Ventube" for the entire project.

For Information and samples write to:—

E. I. DU PONT DE NEMOURS & CO., INC.
(Fabrikoid Division)
Fairfield, Conn.

DU PONT VENTUBE REG. U.S. PAT. OFF.



Step-by-Step
Handling Forms
By ADOLPH J. ACKERMAN

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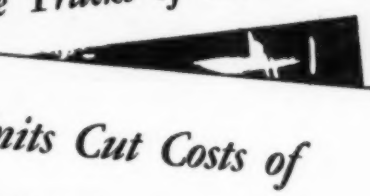
Raised-Edge Curb for Concrete Pavement

Building Wreckers Develop
"Upside-Down" Method
of Orderly Demolition

HYDRAULIC BORING MACHINE
Installs Telephone Conduits Under
Main-Line Tracks of Railroad



Portable Repair Units Cut Costs of
Asphalt Cold Patches

PUMPED CONCRETE
Cuts Cost of Floors and Roof of
Five-Story Albany Post Office

STIFF-LEG DERRICKS
Handle Materials for
How to Increase Efficiency at the
BATCHING PLANT

From a report by ANDREW P. ANDERSON, Highway Engineer, Division of Mate...

Planning and Planting
Medium-Sized Jobs

By J. B. BURGHARDT,
Formerly Construction Superintendent for J. R. Hampson & Co., Inc.

HOW

• • •

The reading pages show you "HOW"—

The advertising pages show you "WHAT WITH"—

— a service combination hard to beat.

• • •

See page 3 for "HOW" items in the editorial pages.

See pages 92 and 93 for "WHAT WITH" items made by manufacturers whose advertisements appear in this issue.

If you do not find what you are looking for —

Write

CONSTRUCTION METHODS
Information Bureau
330 West 42nd St., New York City

KRANE KAR

"A KEY UNIT" • • "AN ESSENTIAL UNIT"

AT NORRIS DAM — the engineers say; "KRANE KAR is a *Key Unit*, speeding form handling and simplifying form work."

At PIERS 32 and 88, Hudson River, N. Y., the contractor on these 1200 ft. piers says; "KRANE KAR is an *Essential Unit* for handling safely and rapidly the frames, doors, and panels, unloading and placing steel work in close quarters and under difficult conditions."

KRANE KAR is a gasoline powered Swing Boom Crane, self-propelled on rubber-tired wheels, capable of traveling with the load and provided with independently operated power winch units.

KRANE KAR — The LITTLE CRANE with all the BIG CRANE features — *use it on your next job.*

Send for Bulletin No. 45, with complete specifications, blueprints and many illustrations.

SILENT HOIST WINCH & CRANE CO.
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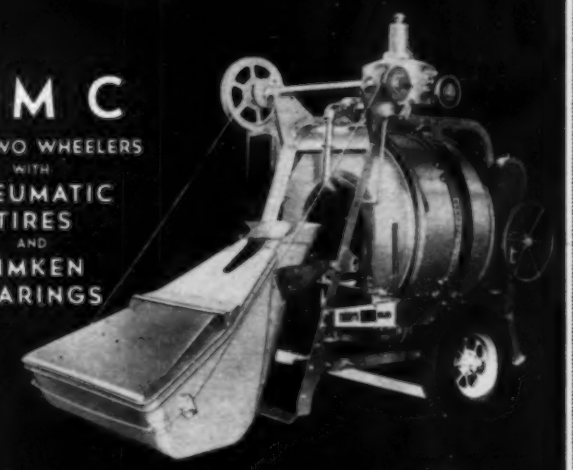

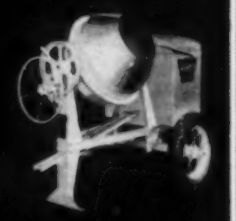

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Model 20
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WEIGHS ONLY 10 TONS

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- Helical cut gears—noiseless, long wearing.
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⅜ yd. (Tractor Shovel)	¾ Circle
½ yd.	30
⅝ yd.	38
¾ yd.	45
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1 yd.	62
1¼ yd.	65

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5 for William L. Lathers, Jr.

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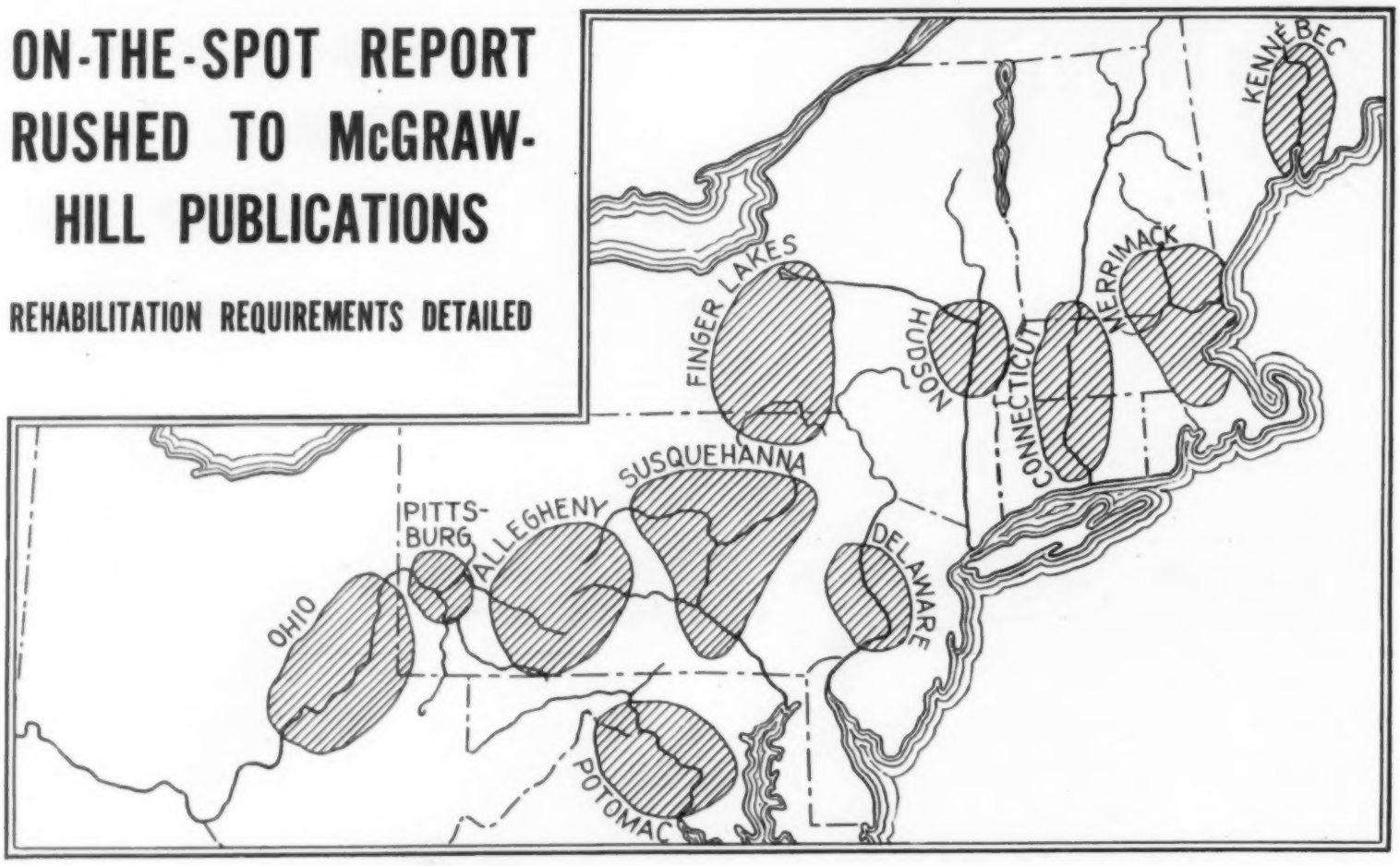
McGRAW-HILL EDITORS SURVEY INDUSTRY'S FLOOD-DAMAGE

ON-THE-SPOT REPORT RUSHED TO McGRAW-HILL PUBLICATIONS

REHABILITATION REQUIREMENTS DETAILED



As the crescendo of newspaper headlines diminishes and the receding sea of water leaves desolation in mud-filled, water-damaged industrial plants, McGraw-Hill editors render a vital service to all industry in a plant-by-plant survey of the actual damage done, and the compelling needs created. More far-reaching in its consequences than the regrettable damage to residential property is the forced interruption of industrial production. Already, as this is being written, vital news is rolling in, being compiled and interpreted for inclusion in the current issues of McGraw-Hill Publications. For business is waiting for and must have the answers to many important questions.

THE TIME IS RIGHT... THE NEED IS EVIDENT...

McGRAW-HILL

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American Machinist	Coal Age	Electrical Merchandising
Aviation	Chemical & Metallurgical Engineering	Electrical West
Bus Transportation	Construction Methods	Electrical Wholesaling
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Factories
Central Power Stations
Transportation Systems
Communication Systems
Water Works
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Bridges
Highways
Stores
Office Buildings

What shortages will we have . . . for how long?

What new construction is necessary?

How much re-equipment?

How will the flood affect business?

What is the extent of corrosion by water?

What methods of financing will be used?

To what extent were affected areas protected by insurance?

McGRAW-HILL PUBLICATIONS SUPPLY THE FACTS

McGraw-Hill Publications will answer these and other questions business asks, as fast as the facts become available, thus saving countless hours of time and expense to Industry's suppliers.

VITAL READJUSTMENTS AHEAD

First-hand facts gathered on the scene by McGraw-Hill Editors give industrial leaders the vital information needed for the readjustment of their production and sales organizations; and clear the decks to render that prompt and essential assistance the stricken industrial areas must have.

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THE MONEY IS AVAILABLE...

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EQUIPMENT and MATERIALS

An index of products made by manufacturers whose advertisements appear in this issue of Construction Methods.

If you do not find all you need in the advertising section, we shall be glad to assist you. Write to —

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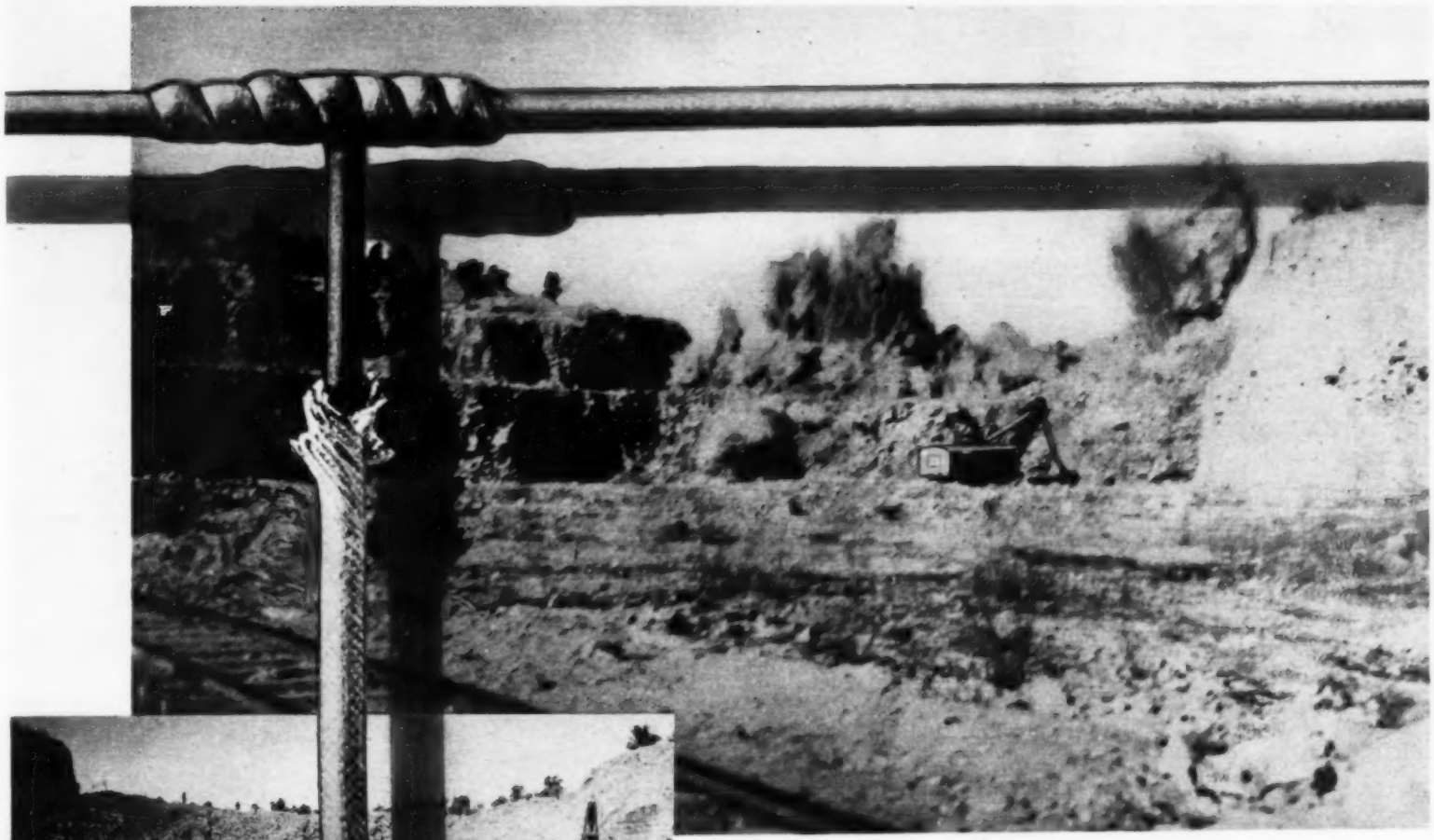

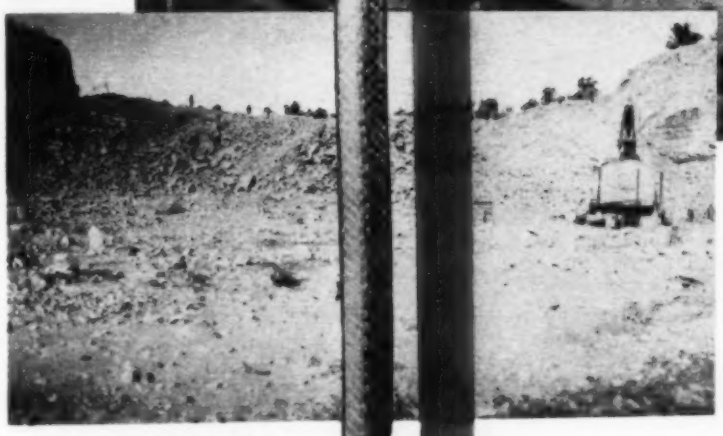

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FIRE!...

and 142 holes worked together

Teamwork, made possible by the use of Cordeau-Bickford Detonating Fuse, produced 160,000 tons of rock from a single shot. The Colorado Portland Cement Company, at Portland, Colorado, made this shot at their lime quarry using 8,780 feet of Cordeau. There were 142 holes in the blast, averaging 40 feet deep.

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Send for a copy of the Cordeau book.

1836 BEGINNING A NEW CENTURY 1936 · ENSIGN-BICKFORD SAFETY FUSE ·

CB-51

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Cletrac
Crawler Tractors
Built To Endure
REG. U.S. PAT. OFF.

● Trailbuilding and bulldozing is so large a part of the construction work for which crawler tractors are used, that bulldozing performance is commonly recognized as a rough and ready test of power and stamina.

Cletrac construction features—especially its dual-acting precompressed buffer spring, its completely welded main frame, its dead axle shaft, its controlled differential steering and its one-piece alloy steel track shoes—explain why Cletrac 80 Diesels have never been outperformed in this type of work.

*** For Example . . .** *Through six miles of solid red granite, requiring 10 carloads of explosives for blasting, a Cletrac 80 Diesel and trailbuilder made the Lyons Road entrance to the Rocky Mountain National Park. The contractor says: "Cletrac performance on this job did not surprise me at all. That's why I am using four of them."*

THE CLEVELAND TRACTOR CO. • CLEVELAND, OHIO